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THE MANUFACTURE OF SHRAPNEL

THE CASTING AND MACHINING BRASS PLUGS AND SOCKETS USED IN THE SHRAPNEL SHELL.

BY PRACTICAL.

Within the last few months the manufacture of shrapnel has become a great industry. There are at present a large number of firms in the Eastern States and Canada engaged in this work, and the number is constantly increasing. There are eight component parts in the manufacture of shrapnel shells comprising the forged steel shell, blank forged steel discs, tin powder cup, brass tube, brass plug and socket, 7 pounds 1¾ ounces of lead bullets, and the copper driving band. Among the foregoing parts mentioned, the non-ferrous metals play an important part in the manufacture of shrapnel shells.

The shells are furnished to the British, Russian and French governments. The principles involved in the

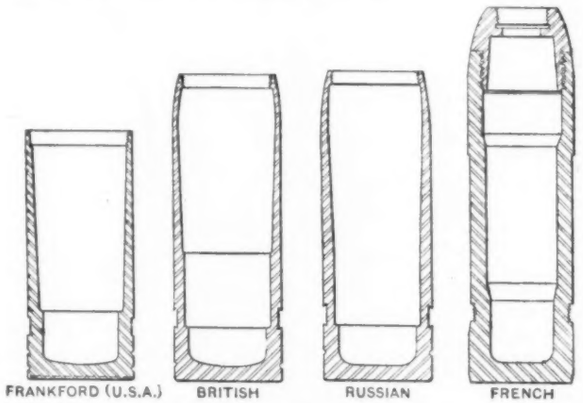


FIG. 1. STYLES OF SHRAPNEL USED BY DIFFERENT COUNTRIES.

manufacture of the plugs and sockets vary slightly in construction, as shown in the design of the shells used by the different countries (see Fig. 1). Until the outbreak of the war, with the exception of the Dominion arsenal, located at Quebec, Canada, not one factory in Canada had made a shell or parts thereof. Now the contracts for shrapnel shells will amount to $80,000,000. Over 100,000 shells had been delivered in England alone by February 1, and one manufacturer has an order for 5,000,000 for Russia, and began to make deliveries March 1. These shell parts are manufactured at one uniform price, and undergo two forms of inspection, first the examination of the parts under appointed inspectors at the plants manufacturing the goods and secondly the inspection by the government officers which consists of the final examination. The following article will describe the manufacture and methods followed in producing the brass plug and socket.

CASTING THE BLANKS.

The casting of the blanks or round forms which constitute these articles is the simplest and easiest operation in their manufacture. Owing to the specifications calling for a very high tensile strength and elongation, they have to be cast from a manganese bronze alloy composed of copper 55, zinc 40, tin ½, lead 2, aluminum 2 and manganese 0.5 parts. All practical foundrymen know the troubles that arise from using a mixture of the above alloy, owing to the shrinkage. To overcome this the castings are poured into ingot molds which are bored out to the required depths and

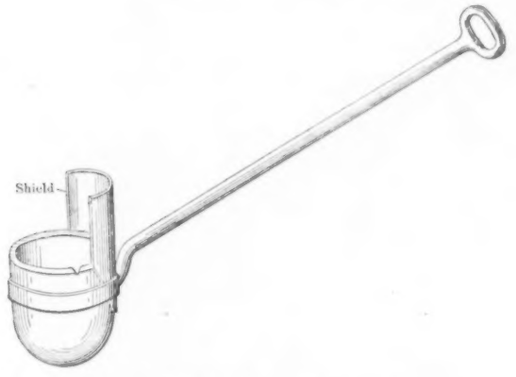


FIG. 2. LADLE WITH SHIELD APPLIED.

diameters. The molds are made from cast iron and have eighteen cavities for the plug and twelve for the socket castings. They are placed at a height of 18 inches for convenience in pouring and dumping. The metal is poured into small crucibles equipped as ladles with a shield attached. The shield protects the eyes against splashes and also permits the user to see the cavities in the molds (see Fig 2).

The practical foundryman can see from the above methods and description how he can increase his production in producing these blanks over sand molding. It requires no skill or high priced labor; the furnace tender attends to the mixing and melting of the metal and pouring into small crucibles. By using two furnaces and making a continuous pouring operation, 10,000 of these can be produced per day. They are all ready for the first operation when they are dumped out of the molds, as there are no gates to be cut off or

grinding and tumbling to remove sand or fins. When they are delivered to machine department the bottom side of the casting and the outside is smooth and square, the cavities are lubricated with a composition

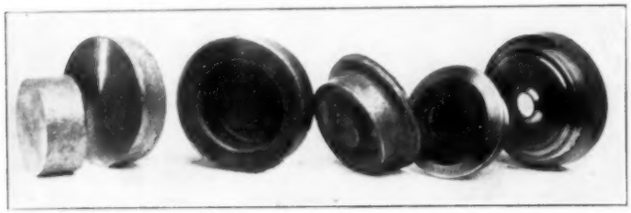


FIG. 3. PLUGS AND SOCKETS, ROUGH AND FINISHED.

of beeswax, lard oil and graphite made into a thin solution and applied with a brush.

WORKING THE CASTING.

The top part of the castings have a rough surface and they are placed in a continuous milling machine which faces off 3,500 per day. This reduces them also to the desired thickness of not under 7/8 inch or over 57/64 inch for the plugs, and not under 11/16 or over 43/64 inch for the sockets. The diameter of the plugs is 1 5/8 inches and the sockets 2 11/16 inches, when they are ready to be put under a 500-ton hydraulic press to be forged to the desired shape (see Fig. 3).

They are now ready for the machining operations, which are very exacting, as some of the dimensions have to machine within a limit of from one to three-thousandths. The specifications call for ten gauges to be used on the plug and fifteen on the socket. There are a number of them enter and non-enter gauges.

The Pratt and Whitney Company, Hartford, Conn.,

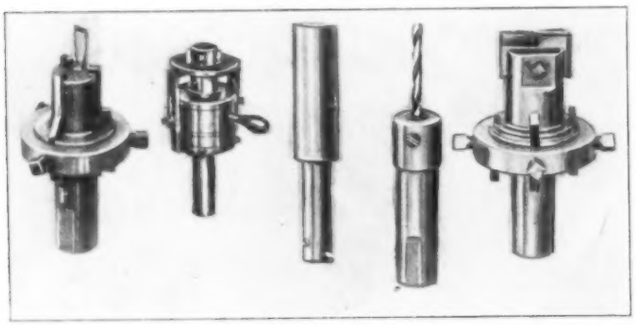


FIG. 4. TAPS USED IN FIRST THREADING OPERATION ON SOCKETS.

make master sets of these gauges or templets, and all the manufacturers that supplied themselves with them had less trouble in the manufacture of their goods than the ones that attempted to make their own. The trouble seems to have been they would not check up to the inspector's gauges, owing to the small allowances.

Owing to the castings going through the forging or blanking process, the metal is very dense and should be machined with a cooling fluid or lubricant, as in the course of machining a high heat is generated by the action of the tools. One of the best fluids and lubricants is aqualine, which is very economical and is mixed with cold water. It is manufactured by the Crescent Oil Company, 50 Church street, New York, and Indianapolis, Ind. The lathes best adapted for machining these parts are 14-inch or 16-inch plain or with gear friction set-over turret lathes manufactured by the Warner and Swasey Company, or Bardons and Oliver Company, Cleveland, Ohio.

The tooling equipment is an important feature owing to the density and toughness of the metal, which necessitates the use of up-to-date tools.

The first operation that the socket undergoes is in the formation of the female thread end for which is required the following tools; a centering twist drill, a roughing drill, a finishing drill, a slide recessing tool where the turret lathe has no set-over which is designed for facing the bottom parallel and recessing at the bottom of the thread. Also an adjustable collapsible tap. The bottom must be perfectly square and the tapping must be in line with the hole in bottom and not be over size. To keep the inside diameter to size, a sizing or bottoming tap is run in by hand after all machine operations are completed to clean

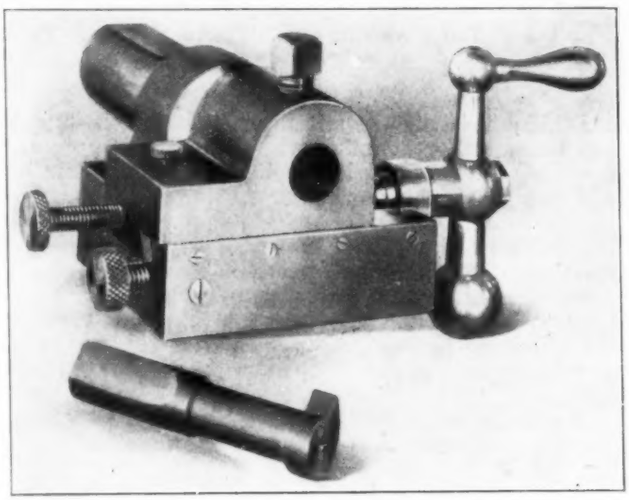


FIG. 4A. TOOL USED IN TAPPING SOCKETS.

out and remove any foreign substance (see Fig. 4), tools used on tapping sockets.

The second operation is the male thread end, which is made to very close limits, as a variation of a five-hundredth part of an inch in the diameter of thread will cause the rejection (see Fig. 5 for tools used in operation).

A pilot is used in a self-opening die head when cutting threads, so that the thread will not be eccentric with the hole, as it has to screw into a concentric gauge, and if the thread is eccentric, it will not enter. The solid adjustable die is used as a finishing cut to

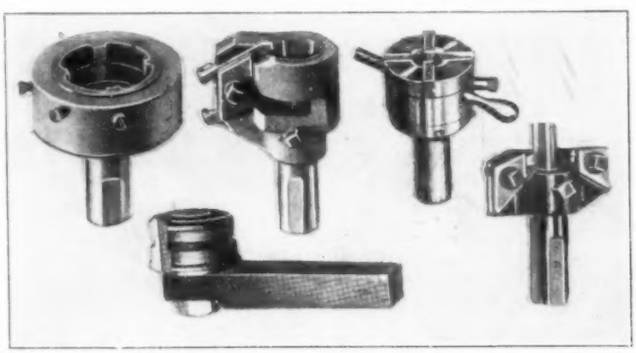


FIG. 5. TOOLS USED IN THREADING MALE PLUG.

hold to size, as it is impossible to hold size with one cut, owing to the short length of thread and the variation in the hardness of the metals. The plug or male part is stamped with the government's figures on each side of the female square.

A two-jawed universal aero-chuck is used for driving the piece and allows for any variation in the diameter. The chuck is operated by air and manufactured by the Manufacturers' Equipment Company, of Chicago, Ill. (see Fig. 6 for tool equipment for machining plugs).

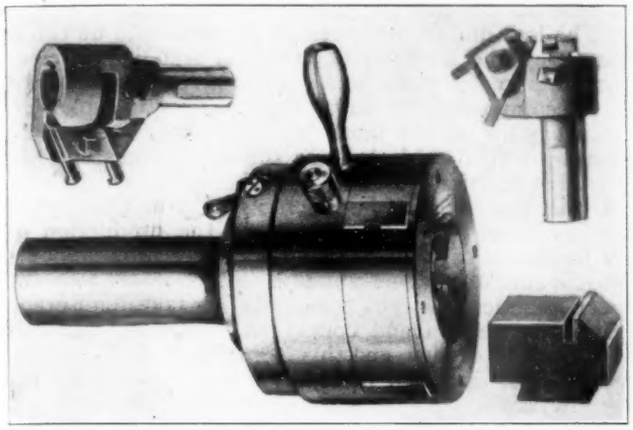


FIG. 6. TOOL EQUIPMENT FOR MACHINING PLUGS.

The forming is accomplished with an undercut blade, as the work on beveled part must be perfectly smooth. Bevel must conform to bevel or seat on female thread gauge, so that there is a solid bearing on the bevel of socket. They are subjected to an inspection so that a feeler three thousandths part of an inch in thickness will not enter at any point.

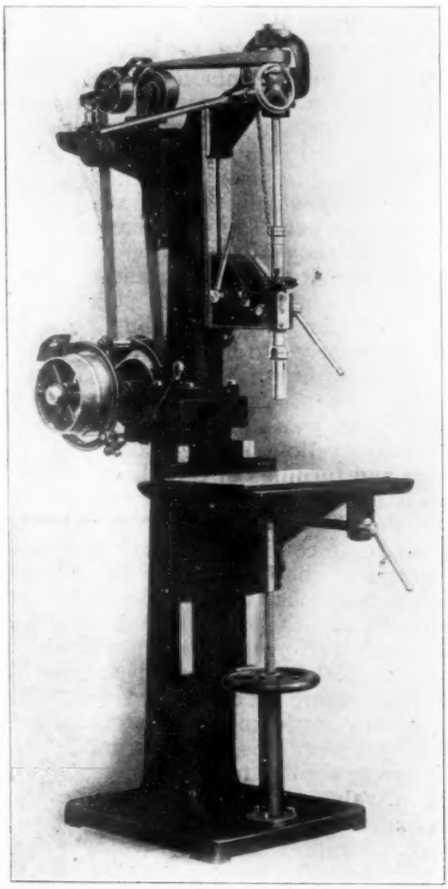


FIG. 7. DRILL PRESS USED ON SHRAPNEL. MANUFACTURED BY HENRY & WRIGHT MANUFACTURING COMPANY, HARTFORD, CONN.

There are three other double or limit gauges, an enter or non-enter for diameter of plug. Also enter and non-enter for thread diameter, and also thread gauges where the profile is used on the bottom or boss. A grub screw hole is drilled and tapped in the socket by using a three-spindle drill press and Errington tapping chuck. One of the best drill presses used on this operation is manufactured by the Henry and Wright Manufacturing Company, Hartford, Conn. Also the Kern Machine Tool Company, Hamilton, O. They are placed in a jig and two different sizes of drills and taps are used.

The plugs and sockets are now ready for the minute and official inspection, which they are subjected to by the inspectors. If found O. K. they are stamped with the manufacturer's name and official stamp of inspection.

The machining output on this class of brass goods, due to the toughness and density of the metal and the close limits that govern the work, is a slow procedure, compared to the average run of brass work, and the loss in machining is high. Great care and time has to be used in governing the machining operations. All threads on these goods are standard Whitworth thread, 14 threads per inch.

CONTRABAND OF WAR.

A proclamation revising the list of articles to be treated as contraband of war has been issued recently by the British government, all previous ones on the same subject having been withdrawn. The articles enumerated in Schedule I will in future be treated as absolute contraband, and the articles mentioned under Schedule II will be considered as conditional contraband.

SCHEDULE I.

Powder and explosives specially prepared for use in war. Ingredients of explosives, viz., nitric acid, sulphuric acid, glycerine, acetone, calcium acetate and all other metallic acetates, sulphur, potassium nitrate, the fractions of the distillation products of coal tar between benzol and cresol inclusive, aniline, methylaniline, dimethlaniline, ammonium perchlorate, sodium perchlorate, sodium chlorate, barium chlorate, ammonium nitrate, cyanamide, potassium chlorate, calcium nitrate, mercury.

Ferroalloys, including ferrotungsten, ferromolybdenum, ferromanganese, ferrovanadium, ferrochrome.

The following metals: Tungsten, molybdenum, vanadium, nickel, selenium, cobalt, pig iron, manganese.

The following ores: Wolframite, scheelite, molybdenite, manganese ore, nickel ore, chrome ore, hematite, zinc ore, lead ore, bauxite.

Aluminum, alumina and salts of aluminum. Antimony, together with the sulphides and oxides of antimony. Copper, unwrought and part wrought, and copper wire. Lead, pig, sheet or pipe. Iron pyrites. Mineral oils and motor spirit, except lubricating oils.

SCHEDULE II.

Fuel, other than mineral oils. Lubricants.

Powder and explosives not specially prepared for use in war.

COPPER IN JAPAN.

Copper is said to be Japan's most important mineral product. In 1913 the output was 3,410 metric tons over the previous record of 61,471 tons in 1912, the values for the two years being $20,716,800 and $20,045,526, respectively. The greater part of the ore mined in Japan is smelted at the mines, exports for 1912 and 1913 being less than $1,000.

THE FOUNDRY USE OF NON-FERROUS SCRAP METALS*

AN INTERESTING RECITAL OF HOW UNCLE SAM SAVES MONEY IN HIS OWN SHOP.

BY LIEUTENANT F. M. PERKINS, U. S. N.

The following method of using non-ferrous scrap metals at the Puget Sound Navy Yard is the result of some three years of attention to the subject and has proved to be very satisfactory.

Little of originality is claimed for the method or for the principle upon which it is based. It is, in fact, about the only logical way in which to handle the scrap question and one which soon suggests itself to anyone interested in foundry work and is, undoubtedly, now in general use to a certain extent. The following is, therefore, simply a description of s systematic and orderly method of applying an old idea together with some data illustrative of the results of the method.

The primary object of using scrap metals in the foundry is a reduction in the cost of castings, and this must be obtained without a reduction in the quality. These two considerations are not incompatible; they are, on the contrary, complementary when the scrap is properly used.

SAVING BY USING SCRAP.

Before attempting to outline a method of using scrap it may be well to illustrate by a little simple arithmetic the extent of the saving which may be effected by the proper use of scrap. Take scrap gun bronze for example; its composition will be approximately:

	Per Cent.
Copper	88
Tin	10
Zinc	2

Now if this scrap gun bronze is not used in the further manufacture of gun bronze, but, through lack of knowledge of its composition or through belief that good bronze cannot be made from scrap, it is used in the manufacture of some lower-grade alloy, say cast naval brass, we shall have the gun-bronze mixture substituted for an alloy which is only required to be up to the following standard:

	Per Cent.
Copper	62.00
Tin	0.05
Zinc	37.95

The loss due to the substitution of the high-grade scrap for naval (yellow) brass is equal to the actual difference in value between the metals composing the two alloys. Let us figure, for example, what the loss would be if 100 pounds of scrap gun bronze were substituted for 100 pounds of naval brass.

Value of 100 Pounds of Gun Bronze.*	
Copper, 88 pounds at $0.16	$14.08
Tin, 10 pounds at $0.35	3.50
Zinc, 2 pounds at $0.06	.12
Total	$17.70

Value of 100 Pounds of Naval Brass.	
Copper, 62 pounds at $0.16	$9.92
Tin, .05 pound at $0.35	.02
Zinc, 37.95 pounds at $0.06	2.28
Total	$12.22

The difference in value is $5.48 per hundred pounds, or about 5½ cents per pound; or, in other words, gun bronze is worth about 45 per cent. more than naval brass. It is quite apparent that good gun-bronze scrap should not be used for making naval brass.

The loss due to the excess of copper could be eliminated by the addition of zinc and lead in sufficient amounts to reduce the scrap gun bronze to the approximate composition of naval brass. The tin, however, which is by far the most valuable component, would cause a considerable loss, as the naval brass mixture requires practically no tin. Another great objection to this method is that if both scrap gun bronze and scrap yellow brass were to be used in the production of yellow-brass castings the supply of scrap for this purpose would exceed the demand. Furthermore, it is not good practice nor is it economical to take high-grade gun-bronze scrap and convert it to yellow brass by the addition of zinc, and this is due to the fact that the gun bronze is much more free from impurities than yellow brass. Its use in this manner is, therefore, wasteful. It is like putting a four-dollar man on a two-dollar job.

Gun bronze and naval brass have been taken as an illustration; the foregoing remarks apply also to several other high copper-bearing alloys related to gun bronze and several comparatively low copper-bearing alloys related to naval brass.

SEGREGATION OF SCRAP.

The method in most common use and the one recommended is, briefly, to segregate the scrap according to composition, to melt it in large quantities, to obtain homogeneous lots, to pig it, analyze it and to use it, with the proper additions of virgin metals, in the manufacture of the alloy which it most nearly approximates. This method, properly applied, has no apparent ill effects upon the alloys, but, on the contrary, seems to improve their physical properties and casting qualities.

The first and a most essential point is the careful segregation of the scrap according to composition. The scrap is delivered to bins built alongside the yard railroad track within a few yards of the foundry. Separate bins are provided for the stowage of scrap copper, zinc, lead, gun bronze, phosphor bronze, manganese bronze, yellow brass, and separate bins for the borings and turnings of each kind. Metallic-packing scrap is stowed in the foundry and babbitt scrap is kept in the machine shop on the babbitting floor. Non-ferrous scrap coming off ships under repair is delivered in cars to the bins. Here the master molder, or a leading man, looks over the scrap and supervises its distribution into the various bins. It is a comparatively easy matter for an experienced and intelligent molder to properly separate the scrap. From the nature of the casting he can tell of what composition it was originally made and can also readily determine by the color whether it is yellow brass or "red brass." The latter term applies to high copper-bearing alloys such as gun, valve and phosphor bronze. No trouble has been experienced in properly classifying scrap of this nature. Scrap castings containing pieces of iron or steel, such as bolts, nuts, studs, etc., are thrown to one side and the iron or steel removed before placing the scrap in the bins. Copper pipe is first taken to the blacksmith shop, placed under a hammer and flattened and then cut in the shears into convenient lengths for charging. Heavy copper-wire condenser

*Paper in the Journal of the American Society of Naval Engineers, February, 1915.

tubes, long pieces of sheet copper, sheet brass, etc., are also cut in the shears to convenient lengths. Light sheet copper and light copper wire are heated in an open wood fire and tamped into shape for charging. Heavy castings which are too large for charging are heated and broken up with a sledge or the drop.

The proper segregation of scrap borings and turnings must commence in the machine shop where they accumulate. A removable pan for receiving borings and turnings is placed under each machine. The leading men are held responsible for seeing that the pan is changed or emptied when the kind of material to be worked on in the machine is changed. Several stations are provided for receiving the borings and turnings, each station having several labelled boxes capable of holding several days' accumulation of the various kinds of turnings. The turnings are collected about

FIG. 1. REVERSIBLE MOLD FOR CASTING SCRAP BRASS AT FOUNDRY.

twice a week, run through a magnetic separator to rid them of what iron and steel have found their way in, and then delivered in the boxes to the foundry bins.

In handling borings and turnings special care is taken to guard against the introduction of iron or steel filings, drillings, turnings, etc. Sweepers are not allowed to use the scrap boxes for receptacles for their sweepings, as these always contain iron and steel filings and dust. Too much must not be left to the magnetic separator; it removes a large proportion of the iron and steel, but not all. The borings and turnings from babbitt and metallic packing also require care in handling; these metals are expensive and in this form are easily spoiled. Little chips of iron and brass will not melt down when these white metals are remelted, and they form hard spots which will score a rod or journal. Brass borings in particular must be kept out of white metals for, of course, they cannot be removed by the magnetic separator. Metallic packing and babbitt must not be allowed to become mixed; the two metals are difficult to distinguish by sight and are usually of widely differing composition.

A little care in the machine shop will pay big dividends in the foundry in the form of increased purity and consequent increased value of the scrap. A handful of iron will ruin a hundred pounds of babbitt.

ADVANTAGES OF PIGGING SCRAP.

As the various scrap metals accumulate in sufficient quantities in the foundry bins they are pigged; the cost of pigging and the melting loss being charged to title Z orders issued upon request of the general storekeeper. These charges are prorated on the metal pigged on a per pound basis. Scrap metals are pigged in large quantities (about 25,000 pounds and over) at a cost of about ¼ cent per pound plus the melting loss. This loss varies considerably with different grades of scrap, and will run from two or three per cent. in alloys containing little or no zinc to eight or nine per cent. in alloys high in zinc.

In figuring the actual money loss due to volatilization, furnace loss or "shrinkage," as it is variously called, it should be remembered that, in the case of metals high in zinc, the metal which is lost is not of the same composition as the alloy being melted, but contains relatively a much higher amount of zinc. As zinc is the cheapest metal found to any extent in the brasses this reduces the actual money loss to considerably less than the percentage of loss by weight would seem to indicate. For example: Suppose that in melting 100 pounds of yellow brass containing copper 60 per cent., zinc 40 per cent., valued at $12.00, or 12 cents per pound, the melting loss amounts to 8 per cent., or 8 pounds. The actual loss then is not 8 per cent. of $12.00, or $0.96, but approximately 6 pounds of zinc at $0.06 per pound plus 2 pounds of copper at $0.16 per pound, or $0.68. Thus, while the melting loss by weight amounts to 8 per cent., the actual loss in money is only 5.7 per cent. This difference is not at present considered in accounting. In the case of melting scrap for pigging the loss by weight is never actually as great as the weights of a given amount of metal before and after pigging would seem to indicate. Nearly all scrap contains a certain amount of non-metallic foreign material of no value, in the form of dirt, oil, grease, sand, insulating materials, etc. In certain kinds of scrap this may form quite an appreciable amount, and the cheapest and most practicable way to remove it is by fluxing it out in melting.

The primary object of pigging scrap is to reduce it

FIG. 2. REMELTED SCRAP BRASS AT FOUNDRY (ABOUT 110 TONS).

to lots of homogeneous and known composition so that it can be intelligently used in the manufacture of castings. That the actual saving in dollars and cents far outweighs the cost of pigging will hardly be disputed by anyone who has had practical experience with the foundry-scrap question. Beside the direct

saving there are other practical benefits resulting from pigging and melting, by analysis, namely:

1. The metal will be used for the purpose for which it is best suited.
2. A more uniform grade of castings can be produced.
3. It affords an opportunity to cast test pieces for determining the physical properties and casting qualities of the metal before it is made into castings.
4. The scrap can be fluxed and cleaned before it is used for castings.
5. Great reduction in stowage space.
6. If records are kept they provide a means for determining the causes of defects and afford valuable data for continuous improvements.
7. It tends toward increased order and system and more scientific melting in the foundry.

There are a few cases wherein the scrap, by its nature, affords most of the information which is ordinarily obtained by pigging, and in such cases there is no need to take the melting loss due to pigging. If a certain large amount of scrap is known to be of homogeneous composition there is no need to pig it. Condenser tubes, for example, form a continuous source of scrap of unvarying composition, and for this reason should be stowed separately. A large bronze propeller or any other large, single casting can be broken up, a sample taken and analyzed, and the metal used to the best advantage without being pigged. Such cases, however, form but a small percentage of the total amount of scrap.

Copper pipe is a very valuable and highly-prized form of copper scrap and is used without pigging. It is made of a high grade of copper (99.5 per cent. pure) and, either alone or mixed with virgin ingot, produces excellent brass and bronze castings. Scrap lead, if clean, is used directly; if dirty it is melted and cleaned. The two principal sources of scrap zinc are old hull zince and the trimmings, cuttings and drillings from new zinc. The former contain a very large amount of dross while the latter are very pure. The old zinc is run down and the dross skimmed off; the new zinc is used directly.

MELTING DOWN THE SCRAP.

The scrap, having been properly separated and prepared for charging, is melted in a two-ton, oil-fired Hawley-Schwartz furnace in lots of from 3,000 to 5,000 pounds, the capacity of the furnace depending largely upon the shape and density of the scrap. As much care is exercised in the melting of the scrap as in the melting of metal to be used directly in the molds, and this point is of great importance. A charge of a few hundred pounds of scrap and two or three pounds of charcoal is first placed in the pre-heated furnace and the heat turned on. When this charge begins to melt down the molten metal is covered with a heavy layer of charcoal and the remainder of the scrap is charged. The molten metal in the bottom of the furnace, with its covering of charcoal, forms a bath into which the metal runs as it melts down.

The function of the charcoal is to prevent oxidation of the metal. Oxidation or burning of the metal, in addition to causing a high furnace loss, produces blowholes, due to absorption of the oxide in the metal and flaws due to the mechanical inclusion of the hardened metallic oxide.

When molten metal is exposed to the air a film of oxide forms upon the exposed surface, the depth of the film and the rapidity of formation depending somewhat upon the temperature, but primarily upon the affinity of the metal for oxygen. This film, when cooled slightly, becomes a hard scale, and if allowed to enter the mold produces flaws in the casting.

Of all the metals used in the brass foundry, copper has the greatest affinity for oxygen, and it is also the most widely used; hence the necessity for a working knowledge of oxidation and its prevention.

Charcoal reduces oxidation by forming a covering over the molten metal and thereby excluding air. It also reduces the absorption by the metal of the sulphur in the fuel. All the fuels used in brass melting (coal, coke and oil) contain sulphur, which should not be allowed to enter the brass. Charcoal contains no sulphur, but is too expensive to be used as a fuel except in unusual cases.

In order that the charcoal may properly serve its purpose it should be broken up in small pieces; the smaller the pieces that can be used in a furnace or crucible without being blown out by the blast, the greater will be the protection to the metal and the less the expenditure of charcoal.

A flux of borax, rock salt or glass is used to fuse with the dirt and impurities in the scrap and form a slag on the surface of the metal, which is later skimmed off. The amount of flux to be used depends upon the cleanliness of the scrap and upon the amount of zinc contained in the metal, high zinc metals requiring more flux.

The molten scrap is poured into a 1,000-pound ladle swung from the crane, and from this ladle is poured into a reversible ingot mold having a capacity of twenty ingots of about 40 pounds each. Fig. 1 shows the ingot mold, and in the background of the same figure is the furnace used for melting the scrap. After the furnace is well heated 4,000 pounds of metal can be melted in 45 minutes and cast into ingots in about 30 minutes.

The metal is thoroughly stirred in the furnace and again stirred and fluxed with borax in the ladle and skimmed before being poured into the ingot molds. Thorough stirring, both in the furnace and ladle, is of the greatest importance, as it insures uniformity of composition of the entire heat. The serial number of the heat is then stamped on each ingot for purposes of identification and to prevent the possibility of lots becoming mixed. The various lots are then stowed separately in bins with the serial number of each lot posted on the bin containing it. Fig. 2 shows about 100 tons of pigged scrap stamped and ready for stowage in the bins, which are about 20 feet away, but not shown in the picture. The picture gives a good idea of the great saving in stowage space due to pigging.

Standard test pieces are cast, and these and a mixture of drillings from three ingots are sent to the chemist for determination of the composition, tensile strength and elongation. The chemist forwards his results to the shop superintendent, who determines from the data what alloys the scrap is best suited for and computes the amount of new material to be added to the scrap to bring it up to the desired composition.

(To be continued.)

GUN METAL FINISH ON ALUMINUM.

The gun-metal finish can be given aluminum by immersing it for from six to ten seconds in a cold solution of 12 parts hydrochloric acid, 1 part chloride of antimony and 87 parts distilled water. After that, thoroughly wash it in running water for several minutes, dry with heat and lightly buff with a high-speed wheel.

STANDARD OF CLASSIFICATION FOR OLD METALS

THE FOLLOWING STANDARD OF CLASSIFICATION FOR OLD METALS HAS BEEN ADOPTED BY THE NATIONAL ASSOCIATION OF WASTE MATERIAL DEALERS TO BE EFFECTIVE AFTER JANUARY 2, 1915. THIS STANDARD OF CLASSIFICATION WAS UNANIMOUSLY ADOPTED AT A MEETING OF THE METAL DIVISION HELD ON DECEMBER 14, 1914, WHICH ACTION WAS APPROVED BY THE EXECUTIVE COMMITTEE OF THE ASSOCIATION ON THE SAME DATE.

DELIVERY.

Area 1.—a. Delivery of more or less on the specified quantity up to 2½ per cent. is permissible.

b. If the term "about" is used, it is understood that 5 per cest. more or less of the quantity may be delivered.

c. Should the seller fail to make deliveries as specified in the contract, the purchaser has the option of cancelling all of the uncompleted deliveries or holding the seller for whatever damages the purchaser may sustain through failure to deliver and if unable to agree on the amount of damages, the Arbitration Committee of the National Association of Waste Material Dealers, appointed for this purpose, to determine the amount of such damages.

d. In the event that buyer should claim the goods delivered on a contract are not up to the proper standard, and the seller claims that they are a proper delivery, the dispute shall be referred to the Arbitration Committee of the National Association of Waste Material Dealers, to be appointed for that purpose.

e. A contract for a carload, unless otherwise agreed upon, shall mean the minimum quantity recognized by the official classification tariff of the district in which the seller is located.

f. A ton shall be understood to be 2,000 pounds, unless otherwise specified.

HEAVY COPPER.

Base 2.—This shall consist of copper not less than 1/16 inch thick, and may include Trolley Wire, Heavy Field Wire, Heavy Armature Wire, that is not tangled, and also new copper clippings and punchings, untinned and clean and copper segments that are clean.

NO. 1 COPPER WIRE.

Clan 3.—To consist of clean untinned copper wire not smaller than No. 16 B. & S. Wire gauge to be free from burnt copper wire which is brittle and all foreign substances.

NO. 2 COPPER WIRE.

Dale 4.—To consist of miscellaneous clean copper wire such as of necessity would be taken out of the Heavy Copper and the No. 1 Copper Wire, but to be free of hair wire and burnt wire which is brittle.

LIGHT COPPER.

Edge 5.—Shall consist of the bottoms of kettles and boilers, bath tub linings, hair wire, burnt copper wire which is brittle, roofing copper and similar copper, free of visible iron, brass, lead and solder connections, old electrotype shells and free of excessive paint, tar and scale.

COMPOSITION OR RED BRASS.

Face 6.—Shall consist of red scrap brass, valves, machinery bearings and other parts of machinery, including miscellaneous castings made of copper, tin zinc and/ or lead, no piece to measure more than 12 inches over any one part, to be free of Aluminum and Manganese, also free of railroad boxes, cocks and faucets, gates, pot pieces, ingots and burned brass.

RAILROAD BEARINGS.

Gage 7.—Shall consist of railroad boxes or car journal bearings, must be old standard used scrap, free of yellow boxes, plastic and similar bearings, also iron-backed boxes, and must be free of babbitt; also free of excessive grease and dirt.

COCKS AND FAUCETS.

Hive 8.—To be mixed red and yellow, free of gas cocks and beer faucets; shall be at least half red.

HEAVY YELLOW BRASS.

Iris 9.—Shall consist of heavy brass castings, rolled brass, rod brass ends, brass screws and tinned or nickel plated brass tubing; to be free of iron and dirt and must be in pieces not too large for crucibles; no piece to measure more than 12 inches over any one part. Must also be free of aluminum and manganese mixtures. Condenser tubes shall not be considered as Heavy Brass.

LIGHT BRASS.

Jolt 10.—Shall consist of light sheet brass, forks and spoons, miscellaneous brass that is too light for heavy, but to be free of any visible iron, gun shells containing paper or iron loaded lamp bases and of clock works.

NEW BRASS CLIPPINGS.

Lark 11.—Shall consist of the cuttings of new sheet brass to be absolutely clean and free from any foreign substances.

BRASS TUBING.

Mint 12.—Shall consist of brass tubing, free of nickel plating, tinned, soldered or tubes with cast brass connections. To be sound, clean tubes, free of sediment and condenser tubes.

NO. 1 COMPOSITION TURNINGS.

Nook 13.—To be free of aluminum, manganese, plastic and yellow brass turnings, not to contain over 2 per cent. iron, to be free of grindings or foreign material, especially babbitt and free from adulterations made to resemble metal. Turnings not according to this specification subject to sample.

NO. 1 YELLOW BRASS TURNINGS.

Oral 14.—Shall consist of strictly rod turnings, free of aluminum, manganese, composition and tobin turnings. Not to contain over three per cent. of iron, oil or other moisture, to be free of grindings and babbitts. To avoid dispute, to be sold subject to sample.

NO. 1 PEWTER.

Pike 15.—Shall consist of tableware and soda fountain boxes, but in any case must test 84 per cent. tin. Syphon tops to be treated for separately.

AUTO RADIATORS.

Quip 16.—To be classed separately, must be free of iron.

ZINC.

Reef 17.—Must consist of clean sheet and cast zinc, also cast batteries to be free of loose oxide and dross, salamoniac cans and other foreign materials.

BRASS FINISHING AND COLORING

THE FINISHING OF BRUSH BRASS, AND THE CORRECT WAY OF USING BARIUM SULPHIDE TO OBTAIN BEST RESULTS IN THE COLORING OF BRASS.

BY A. A. LE FORT.*

While nearly all platers know how to produce the brush brass finish in some way or other, still this finish which is the standard finish of nearly all the gas and electric fixture manufacturers is quite a problem for the smaller concerns, as the finishes produced by the larger concerns vary to a very large extent, and the smaller concerns have to match the different shades produced in order to sell their goods, hence I will explain the different methods employed to produce the different shades.

In the largest brass manufacturing companies, the work is finished by placing the articles in an automatic machine which revolves under an 18-inch face Tampico wheel under heavy pressure, using a continuous stream of water on the wheel, no pumice or other abrasive is required, the water and pressure employed gives the scratchy effect and is only semi-dull, and which is in demand by nearly all dealers.

For the benefit of the small manufacturers who cannot use an automatic machine to advantage the following methods will give practically the same finish, at a much lower cost than when work is finished with pumice and water. Cut down brass in the usual manner with Tripoli, wash in benzine, and dry in sawdust, I find this the best method of washing. I have tried platers' compound or whale oil soap and several other cleaning compounds to remove the Tripoli, but where water is used, there is always more or less stained work, which is not the case when benzine is used.

After work has been washed and dried, brush on a brass wire scratch brush .003 wire (I use what is called the economy wheel) at a speed of seven hundred and fifty to eight hundred revolutions a minute, using a composition of 1 part plaster of Paris to 3 parts of F. F. pumice, made into a heavy paste with water. This is made into cakes or bricks by using discarded card-board boxes for molds and allowed to stand in molds until perfectly dry. Use the composition on the wheel the same as any buffing or cutting down rouges.

The work thus finished is then ready for lacquering without any further operations, and will be found clean and stainless and look much clearer than work that has been brushed with pumice and water.

While I do not claim to be the originator of the above composition, I have never heard of any such article being advertised or on sale, but know it will prove satisfactory for the light brush brass finish mentioned above, as I use the same every day with perfect results.

For the other shades I use the same size wheels and speed, and the original way of finishing the brass, namely, with pumice and water, using a small amount of pumice in the water, to which has been added a small amount of powdered soap tree bark for the lighter shades, and a larger quantity of pumice and higher pressure on the wheel for the darker shades, then run work through a mixture of common laundry soap and cold water, using about one-half bar of soap to ten gallons of water, then in warm water (not hot). If water is too hot the few drops of water that are left on the work, especially large pieces, dry too quickly, and leave a water spot or stain, which will not occur if water is used only warm. After work has been run through the warm water dry with cloth or towels. Small shells and castings are dried with less labor, by running through the soap and warm water and dried in boxwood sawdust. Screws, chains and all other work of similar nature are economically brushed by the use of a small tumbling barrel, using pumice, sawdust, soap tree bark and water, run through soap and warm water, dried in sawdust, then lacquered in baskets and placed on wire screens to dry.

There are brush brass compositions on the market used for producing brush brass, which give excellent results as far as the finish is concerned, but as they all are in the nature of a pumice or grit mixed with a greasy substance, such as Tripoli, I do not recommend them, for the reason that the compositions are very hard to remove, and the loss in stained work is very high. I have tried several cleaning compounds to remove this grease, but did not find anything that could be called satisfactory, hence I do not advise the use of the brush brass compositions. The brass wire wheels will be found superior to Tampico wheels, as the brass remains clean while being brushed with them, while with the Tampico wheels, there is always a scum left on the brass (unless there is a continuous flow of water on the wheel) which necessitates more labor when drying the work with towels, to remove this scum, and which does not always clean off when drying work in sawdust. Work that is brushed on a Tampico wheel is not as even as when a brass wire wheel is used, unless the Tampico is well worn down. It is almost impossible to finish a piece of work on a new Tampico wheel.

Mix the pumice and water in an eight or ten quart pan and change water and pumice once a day, no running water is necessary at the brushing lathe, simply dip articles in the water from time to time while brushing. Have a jar or pail of clean cold water into which articles are placed after being brushed until ready to dry, to avoid staining.

THE USE OF BARIUM SULPHIDE TO PRODUCE BRONZES ON BRASS.

Use from ½ to 1 ounce of barium sulphide to 1 gallon of water, for dark shades use hot, for lighter shades use luke warm, and give only a dip that shows the color required while in the dip, as when articles are dried in hot water and dry brushed the color is darkened considerably. The mistake is often made in trying to obtain a color, that the operator dips the article for too long a time and a darker shade than the one wanted is always the result, whereas a light dip is all that is required to give satisfactory results. By using aqua ammonia ½ ounce to the gallon deeper brown shades will result. On cheap brass articles, if work is plain and polished, or on castings which have been bright dipped, a quick dip or two will produce a good gilt color, which after being lacquered is far superior to the gilt finishes produced by using coloring in the lacquers, as the colored lacquer fades in a short time, while the gilt produced in this dip is protected for a longer period by the lacquer coating over the colored metal. Nearly all the bronzes on builders' brass hardware can be produced by the barium sulphide solutions, and nearly all shades can be matched if the above directions are followed. Several other shades than those produced by dry brushing can be produced by brushing the articles while wet, on a soft brass wire wheel. Dry articles in the same manner as the brush brass finish.

*Foreman Plater.

THE VALUE OF A TRADE JOURNAL

A Practical Man Suggests How to Benefit From It.

By Franklin W. Hobbs.

We read and hear a great deal in one way and another of efficiency and the high cost of living, trade unions, shorter hours and increased wages. We are told of the value of efficiency and that by study, observation and intelligent application we may become efficient.

The trusts are said to be responsible for the high cost of living. The trade unions, they say, will bring about a remedy by securing shorter hours and increased wages.

That the present high cost of living forms a difficult problem to the average tradesman, no one disputes, and the subject is worthy of some serious reflection for the condition has to be met in some way. No one disputes the fact that the trusts are in a great measure responsible; however, the cost of production plays an important part, and the inefficient, incompetent or lagging workman is constantly contributing to the high cost of production. I believe it is a grave mistake on the part of trade unions when they force up price of labor without paying due attention to the fitness and willingness of each member to do a man's part.

There is a strong tendency to lean upon the union while the important element of efficiency is ignored. The competent foreman or superintendent gauges the value of each man just as a machinist gauges his work, and while a union may force up the wages of all, sooner or later the weeding process begins and those who do not measure up to the standard will very likely find themselves seeking employment elsewhere. It is not my wish to abuse trade unions, yet I would discourage some of their methods and, above everything, discourage the practice of men depending upon the union instead of their personal ability or efficiency.

It seems to me that the average union stunts mental ability and weakens the desire for efficiency by substituting force for brains in securing increased wages. By force I mean strikes, threatened strikes, etc. It is not enough that a tradesman has graduated from the best schools and colleges, has served the allotted time at his trade and belongs to his particular trade union. The present-day wide-awake, progressive, efficient tradesman is constantly on the alert for new methods, solutions, machinery, etc. He observes what others are doing. He experiments, and, above all, he reads one or more up-to-date trade journals and contributes to them. It is not enough that he be familiar with the methods in use in the shops where he is employed. He reads the trade journals and keeps informed upon what the other fellows are doing and in return contributes to the trade journals the results of his own investigations and practice, thereby establishing an exchange of ideas which very often proves the truth of the old saying that "two heads are better than one."

The value of the trade journal cannot be overestimated. I believe every tradesman should read his trade journals from cover to cover; it is a mistake to omit the advertising, they are as important as the articles.

Suppose the superintendent or foreman approaches one of the workman and says, "what about this or that new method, solution, or machine, etc." If the workman takes an up-to-date trade journal and reads it from cover to cover and there is such a new thing he is pretty sure to have got in touch with it either by the articles, the advertising, or the notices, and is able to converse intelligently upon it and the superintendent or foreman appreciates the fact that the man is keeping up to date.

On the other hand, suppose he did not read the trade journals, the chances are good he would have to reply in substance, "I don't know," and it seems to me that the "I-don't-know" man's chances for promotion or increased wages are rather slim.

Books are important and a tradesman should read as many as he can of the best of them, but they do not, and cannot fill the place of the trade journal, for in this age of progress the facts found in the books published last year are behind the times compared to the results of the latest investigations published in the up-to-the-minute journal of this month. I do not claim that every proposition published in the latest journal is best by any means, for in some cases the writers are in error and no article is the last word on the subject, and here again is one of the advantages of the trade journal, every reader has the privilege of criticism; in fact, I believe he is invited to criticise through the journal and the result is that the original writer, the critic, and some of the readers begin to investigate the subject, and whether the original writer were right or wrong enlightenment is bound to follow. Many times in such cases entirely new and valuable methods are brought out as a result of the stimulated thought.

Not long ago I visited a nickel plating plant in which some most ridiculous practices were in vogue. For instance, the glue pot (there was but one) was crusted over with burned glue until there was barely room to insert the one and one-fourth inch brush, although the pot was of about two quarts capacity. The steam, which came in direct contact with the pot, was kept on constantly, and when the glue got low more was added direct to the old cooking rotten mass, and the oldest employee could not remember when it had been cleaned out. A stranger would have no difficulty in locating it unless he were utterly devoid of the sense of smell. Little wonder that the work produced was of poor quality, and expensive when wheels were set up with such material. In the plating room the caustic soda cleaning solution was replenished noon and night, six days in a week, with the greasy, soapy water in which the men had washed. The remark that it was bad practice was greeted with some surprise. Inquiry elicited the fact that not even the foreman had ever read "Langbein," "Watt," "Hawkins," The Metal Industry or any of the well-known books or trade journals bearing upon the trade.

Similar conditions are found in not a few plating shops, and in other trades conditions are to be found quite as ridiculous.

It seems to me that such conditions are due to stupidity, ignorance or, in a word, inefficiency, and that the remedy is a realizing sense of the need of efficiency, followed by earnest, honest application to the work at hand, combined with observation and study, not forgetting to read, criticise and contribute to the best trade journals.

FLUORSPAR PRODUCTION.

Fluorspar production in the United States in 1913 aggregated 115,580 tons, the average price being $6.37. Imports were 22,682 tons which averaged $3.15 in price.

PRESENT-DAY ASPECTS OF ENGLISH FOUNDRY PRACTICE

A Partial Comparison of the Advances Made in the Melting and Molding of Cast Iron and Metals.

By Joseph Horner.

(Concluded from March.)

Multiple molding is another big system that was introduced many years ago, but its rapid growth is a feature which belongs to the present. This requires a machine with a presser head between which and the table the double-sided mold is squeezed. Each such

REVOLVING TYPE OF CORE OVEN. MANUFACTURED BY LONDON EMERY WORKS COMPANY, LONDON, ENGLAND.

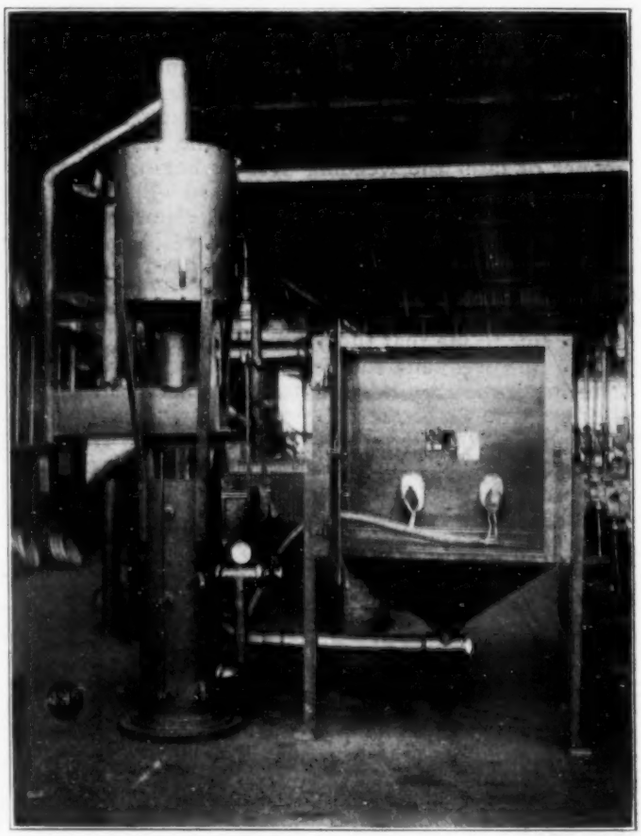
mold contains on its opposite faces a moiety of the closed molds, and the ingate runs right through it to connect the pile of molds. Only the top and bottom portions are exceptions to this, being the ordinary tops and bottoms. A pile of such molds may include a dozen box parts, more or less, and each may also contain several small molds taken from plated patterns, or one only. The total output of a day's work is thus very large.

Snap-flask work is a development that has proceeded along another line. Its advantage is that it avoids the multiplication of molding boxes. The sand is rammed or pressed in a box that is hinged at one corner to open out laterally and so permit of the removal of the mold, which is then placed on the floor and poured unenclosed in a box. The saving in boxes is not the only economy since there is also the time saved which would be occupied in separating the box parts, and in knocking sand and castings out of boxes.

Obviously the scope of the boxless mold is limited. Any mold over 16 inches across cannot be dealt with thus. But an immense volume of small work is included within this dimension. An iron ring is usually rammed in each half mold as a grid to sustain the sand. The halves are maintained in contact during pouring with a weight. A man and a boy working with a mold press can produce from 300 to 400 such molds per day.

Rock-over machines are employed so extensively now that several firms are engaged in their manufacture. Formerly hand operated, some of recent construction are jar-rammed. The term rock-over denotes the fact that the box part after having been rammed is turned over to one side by a movement of a portion of the machine, to avoid carrying it. The small economy is important when multiplied by hundreds of molds.

Portable machines afford a convenient solution of the disposition of the hundreds of molds which form the day's work of the smaller machines. Boxes of molds even though of small dimensions are heavy to carry, as the length of the rows of molds increases



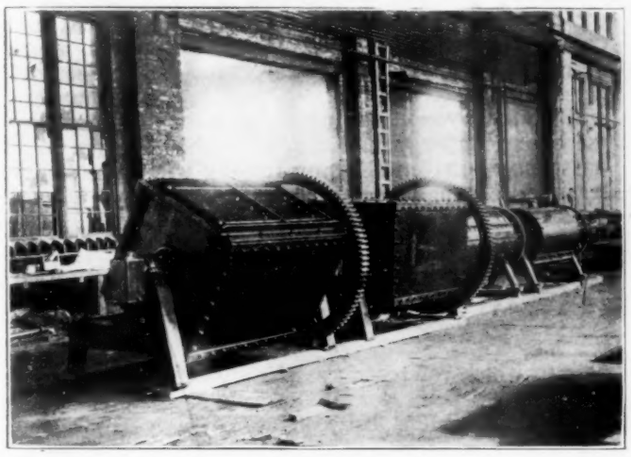
IMPROVED SAND BLAST. BY TILGHMAN'S PATENT SAND BLAST COMPANY, LTD., BROADHEATH, W. MANCHESTER, ENGLAND.

through the day. Light floor tracks occupy too much floor space and some carrying has still to be done. Hence in many foundries the portable machines are employed. The molds are deposited adjacent to the place where they are made and the machine is drawn along to supply successive floor areas. Only light ma-

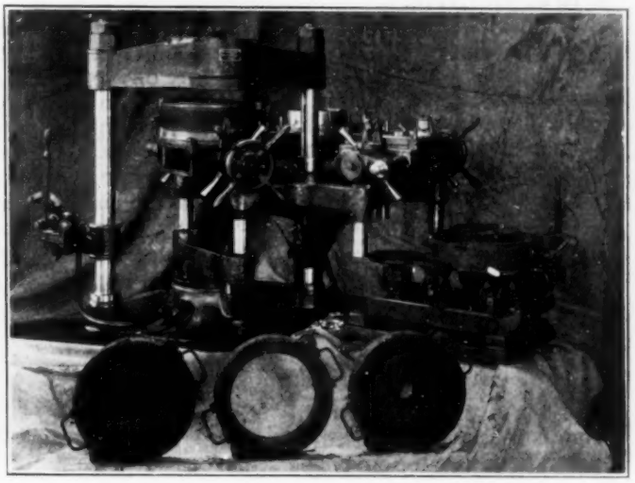
chines and hand operated designs can be so handled, but these are in the majority. The machines, which are mounted on wheels, include the plain mold presses of various designs and the rock-over machines.

A special development is that of turret machines in which patterns are mounted on a table which revolves, bringing successive patterns under the presser head. In an early design the turret was a simple arrangement swung over the molding table used in connection with snap-flask work, or with multiple molds. In one design by the Adams Company the turret top has three sides to receive the drag pressing frame, the cope pressing frame, and the presser head. The three rotating around a horizontal axis are brought in succession over the snap-flask lying on the table. In another design for snap-flasks and multiple-molds the turret has two faces, one of which contains a pattern plate, the other the sand pressing frame, both turning round a horizontal axis.

In recent designs by the Konigle Wurttbg Huttenwerk, of Wasserlfingen, Germany, the turret revolves round a vertical axis in turntable fashion. The table comprises usually three separate working areas, one



TUMBLING BARRELS. BY WHITING FOUNDRY EQUIPMENT COMPANY, HARVEY, ILL.



HYDRAULIC TURRET TYPE MOLDING MACHINE WITH TURN-OVER PLATES.

of which being squeezed under the presser head leaves the two others clear, on which two other men can be working. This is combined with double-sided pressing for the production of multiple-molds. The table carries on each working area a lower pattern plate, the ingate pattern, and a molding box surmounted by a sand frame. When this frame has been filled and strickled level, the upper pattern plate, the edge of which coincides with the inner edge of the sand frame, is laid on it, and the mold squeezed by the presser head. In a modified design the presser head is three-sided and a separate pattern plate is attached to each of the three faces of the head. These machines are modified in several other ways, and are mostly of hydraulic design.

Die-casting has nothing in common with the work of permanent molds beyond the fact of the castings being produced in permanent molds of metal. Die castings are made of the softer alloys only, with low melting points. Neither iron, steel, nor gunmetal can be used for these, but only alloys in which tin, zinc or lead forms the basis. They are cast in molds of steel and are subjected to pressure during solidification. They are used for the parts of light mechanisms which would otherwise be stamped or forged or cast in sand molds, with subsequent tooling. Cast in steel molds and under pressure they are accurate within fine limits and so smooth that no tooling is required. Screw threads are cast to mutual fits, and so are accurate gear teeth. Hard steel parts subject to wear can be cast in the softer alloys.

The steel molds are costly when intricate. Parts have to be made separately when they are undercut, and when holes occur, and provision be made for sliding them within the main mold. Such molds can only be justified by a large production.

Shop arrangements are now designed better, and are more highly systematized than of old. Better systems are necessary because foundries tend to increase in dimensions, and departments are more specialized. In these arrangements are included all the services of the sand preparation and supply, the hoisting and conveying services, and the fettling departments. In each of these the number and variety of machines and appliances increases with foundry growth and specialization.

Sand preparation and supply has in the better class of foundries been transferred from the hand operated riddles and sieves to machines possessing varying degrees of complexity. In the latest stages, in large foundries the sand preparing plant is a self-contained unit, wholly automatic in operation from the initial to the final stages. It begins with a sand drying apparatus, continues through sand crushing and grinding machines, thence through disintegrating and mixing machines in which coal dust ground separately is intermixed with the sand, and thence both are finally riddled and sifted ready for use and conveyed to various locations in the shop.

In smaller foundries the automatic plant is not required, nor are so many machines necessary. But crushing, grinding, disintegrating, mixing, riddling and sifting machines are still essential though less numerous, and they are supplied and supplemented by hand service. In recent years the designs and varieties and dimensions of all these machines have undergone many changes and modifications to meet the ever growing demands of the specializing foundries.

Hoisting and conveying services have of necessity had to grow in order to keep pace with the demands made upon them. No single service meets present-day requirements, but foundries handling different kinds of products call for assistance of different kinds. These

include overhead traveling cranes; fixed jib cranes with horizontal jibs, and racking carriages, swinging through a limited radius or round a complete circle; overhead tracks carrying light hoists, and floor tracks of narrow gauge for trolleys and skips. Each occupies a sphere which cannot be so well served by either one of the others. It is not difficult to determine for any foundry or any department the place which can be suitably filled by either one. Very often two services of different kinds will be desirable for a single department. And when a type of crane has been determined on then selection has to be made from three or four useful power agencies, which again must often be determined by installations already existing or in contemplation. So that the choice becomes a rather intricate one.

The two most remarkable hoisting machines are the electrical overhead traveler, and the overhead trolley hoists. Few large foundries are without one or both of these. Both cover the floor areas without occupying floor space. The first is suitable for all powers required, the second for light loads only, which fact determines the proper sphere for the latter. When average loads exceed one ton or 30 cwt. the traveler is to be preferred.

The utilities of the traveler are limited because of its expense and by the fact that it requires the whole width of the shop to itself, so that only one, or at most two, can be installed in a foundry bay. But a single crane cannot be in all places at once, serving groups of men who make simultaneous demand on its services. So that the installation of a traveler does not lessen the need for the employment of jib cranes. Numbers of these are required in foundries for the local services which the traveler cannot supply. A crane is often held up for an hour or more over a mold, work which the jib cranes are suitable for. The traveler service is chiefly that of transit and the pouring of metal and the handling of the heaviest loads. It must be able to deal with maximum loads, while the cranes are generally used for the medium and lighter ones.

The overhead tracks and their hoists are fitted in foundries or foundry departments where the services are light. They take the place which overhead travelers occupy in heavy casting shops. Though they do not cover the entire floor area they serve the main avenues and localities. They afford, on the whole, a better solution of the service than light overhead travelers or fixed jib cranes would do. The power agencies used for these cranes may be selected to suit the shop conditions, hand, or electricity for the overhead cranes, hand, electricity, or pressure water for the jib cranes, hand, compressed air, or electricity for the hoists for the overhead tracks.

The fettling department is more extensively organized and equipped now than formerly. Besides the old emery grinding wheels and tumbling barrels, it is often now provided with sand blasting machines of cylindrical or of table types, with git cutters and pneumatic chipping chisels. In large foundries it is sometimes a self-contained unit provided with machines and benches and pneumatic exhaust arrangements, grids and underground pipes for the removal of the dust, motor-driven shafting for the wheels and tumblers, and a compressed air plant.

ABRASIVES*

A Descriptive Article Embracing the Various Kinds Used in Grinding and Polishing.

By Clarence Hawke.†

(Concluded from March.)

ARTIFICIAL ALUMINOUS ABRASIVES.

In the manufacture of this class of abrasives highly aluminous clays are fused in an electric arc furnace in such a way that the impurities contained in the raw material are reduced, and a product consisting of almost pure aluminum oxide in crystalline formation is obtained. This fact, which is common to all artificially produced abrasives, is explained by a consideration of the probable differences in the rate of crystallization of a body produced artificially and by natural means. In the latter case the crystallization has obviously been slow, and consequently well developed crystals are formed along well developed lines. The crystallization of an artificially produced material is more rapid with the result that the crystals formed are irregular and possess irregular fractures. Abrasives, of the artificial aluminous class, are characteristically tough, fracture into sharp, irregular crystals and do not possess the regular cleavage common to the natural aluminous abrasives. The hardness of such materials lies between 9.1 and 9.2, which is above that of the natural corundum. Artificial aluminous abrasives are successfully bonded by the vitrified process, and have been found to give excellent results in the grinding of steel and metals possessing extreme toughness. Abrasives of this class are found on the market under the trade names of aloxite, alundum, abrasite, dilemite and barocarbon.

SCALE OF HARDNESS.

A more careful consideration of Mohs's scale of hardness to which reference has already been made is necessary at this point for a clearer understanding of the differences existing between abrasives. This scale of hardness was introduced by Mohs, a German mineralogist. Mohs chose ten commonly occurring minerals, each of practically constant hardness. These were arranged in order according to their ability to scratch or abrade one another. For the softer of these materials talc was chosen and given a hardness equal to 1, and placed at the bottom of the scale. Gypsum was found to have the ability to scratch talc, but was not hard enough to scratch calcit. Gypsum was therefore given a hardness equal to 2 on this scale and followed by calcit with a hardness of 3. The other minerals were then placed in position upon this scale according to their ability to scratch other substances, or to be scratched by them. In this scale the diamond was placed at the top and given a hardness equal to 10. Corundum (sapphire variety) was placed next below it and given a hardness of 9. The topaz followed next in line with a hardness of 8. Here it should be noted that owing to the imperfection of this scale, the actual difference existing between a hardness shown as 9 and one shown as 10 is considerably more than between 9 and 8. This is accounted for by the fact that minerals with a hardness greater than 9 are not common, and because of the experimental difficulties in determining the hardness of such substances. It is, however, generally conceded that the difference 9 to 10 is approximately equal to the difference 1 to 9. Carbide of silicon is therefore probably two or three times harder than the next below it, or those of the class of artificial aluminous abrasives. These in turn are considerably harder than the natural corun-

*Paper read before American Foundrymen's Association.
†Niagara Falls, N. Y.

dum, although their position on the scale is only slightly removed. Mohs's scale of hardness does not give an accurate figure for the hardness of a body, but simply shows its hardness relative to another body.

When choosing the correct abrasive to perform a particular grinding operation it is necessary to carefully consider the properties of the material to be ground. As has already been stated, the hardness of an abrasive is not always the determining factor, for if this were so the hardness would give the best results under each and every condition.

A vital factor to be considered in connection with any grinding operation is the production of heat. The production of a certain amount of heat is common to every grinding operation. This heat can, if produced in excess, work disadvantageously by either burning or drawing the temper of the material being ground, or by causing the grinding tool to fill with the overheated material which it is removing. The production of heat is dependent upon three factors; first, the ultimate strength of the material being ground; second, the rate of removal of stock; and third, the contact area of the grinding tool with the work.

If we attempt to use an abrasive possessing the qualities of extreme hardness and sharpness to grind a material which is tough and of high tensile strength, we find that excessive heat is generated; in other words, the amount of work performed by such an abrasive upon the metal of high tensile strength has been sufficient to produce excessive heating, with the result that the abrasive tool is ruined by filling, or the work burned.

To successfully perform any grinding operation it is of course essential that the abrasive grains used are bound together with a suitable binding material, and that the grade or degree of binding should be adapted to the particular operation. In addition to a correct selection from the great variety of grades made possible in an abrasive tool by a variation of the amount and type of bond used, it is also essential that the abrasive should possess the required properties. For the grinding of hard materials which are of a low ultimate strength, or such materials which are not easily fused, the hardest abrasive is successfully used. When, however, materials of high ultimate strength, or materials which are characteristically tough, such as steel or malleable iron, are to be ground, superior results are obtained from a softer abrasive, such as found in the artificial aluminous class, as the penetration under a fixed or constant pressure would depend to a large extent upon the hardness of the abrasive. Upon the extent of this penetration depends the amount of work done and also the amount of heat generated. Although a deep penetration is permissible in the case of a material of low ultimate strength, or one that is not easily fused, it is liable to produce excessive heating in the case of materials of high ultimate strength.

Another characteristic which is essential to an abrasive for the successful grinding of steel is toughness. This property is possessed in a marked degree by abrasives of the artificial aluminous class, and is responsible to a certain extent for their superiority for the grinding of tough metals, over the harder but less tough abrasive "silicon carbide." This characteristic is obviously essential to the successful grinding of such materials when we consider the necessity of the abrasive grain holding the bite or depth of penetration taken and carrying it across the contact area of the tool with the work. If an abrasive grain is not sufficiently tough to hold such a cut and withstand the strain put upon it by the resistance of the material being ground, it will fracture too rapidly, or before it has had sufficient time to perform the work required of it. Such a condition would result in an excessive wheel loss without the required removal of material. The slightly softer but tougher artificial aluminous abrasive is favored in this respect in two ways when called upon to grind materials of high tensile strength; first, as the slightly softer material does not penetrate or bite into the material being ground, to the extent of a harder abrasive, the depth of bite and consequently the strain put on the individual grain is not as great as would be the case with a harder material. Secondly, with superior toughness it is able to hold the cut or bite taken, which in the first place is not as great as would be the case with the less tough but harder and sharp abrasive.

The necessity of selecting the correct type and grade of bond has already been referred to. For such a selection a knowledge of the actual conditions under which a grinding operation is to be performed is essential. The grade or degree of binding required in an abrasive wheel is governed to a large extent by the amount of dressing action present in the operation. The contact area of the wheel with work, the relative speed between wheel and work, as well as the depth of the cut and the condition of the surface being ground, all tend to control the amount of dressing action produced. These must all be considered in addition to the properties of the material being ground and the final finish required. Other important factors are the application of the abrasive wheel to the work and the construction of the grinding material used. If the work is automatically applied to the wheel a far more loosely bonded wheel can be used than is required to grind similar materials applied by hand, as the dressing action in the former case is far less than in the latter. For precision work rigidly built machinery is absolutely imperative to the production of satisfactory results. This factor must receive consideration when selecting the correct abrasive wheel for such work, as vibration increases the dressing action upon the wheel considerably.

In general, the successful bonding of the correctly chosen abrasive grains into the form of an abrasive wheel or tool depends upon the property of the bond used to break down at the proper rate. This rate should be sufficient to allow each abrasive grain to perform the maximum amount of work possible to such a grain before it is released from the mass of the wheel. It should also be sufficient to prevent the wheel from glazing. In other words, the grade or hardness of the abrasive tool should be sufficient to permit a rate of wearing away which will at all times leave a sharp cutting surface on the abrasive tool and allow for a maximum utilization of the cutting possibilities of each grain of abrasive material. The actual type or characteristic of hardness and toughness possessed by the bonding materials used plays an important part in the success of an abrasive wheel. The size of the grit selected for a particular grinding proposition is also a matter of vital importance, as upon this factor will depend to a large extent the rate of removal of material, and consequently the heat developed. The final finish depends also upon this factor, and is often a limiting condition.

It is a general practice among abrasive wheel manufacturers to signify the size of the abrasive grain used by adopting numerals representing the number of the screen through which the grit designated has passed. These screens are numbered in accordance with the number of meshes per linear inch, so that a grit or grain designated as No. 24 would imply that the grit had passed through a No. 24 mesh screen, but would not pass through the next finer mesh used in the system.

In the class of artificially produced aluminous abrasives and carborundum we have a combination of characteristics required by abrasives for the successful grinding of metals of the hardest as well as the softest varieties, and those of the lowest as well as the highest tensile strength

By properly binding such materials to suit the actual conditions found in any grinding operation, results have been obtained which have been shown to be far superior to anything obtained by the use of natural abrasives, both as regards rapidity of production and economical working.

With such materials it has been possible to successfully perform grinding operations beyond the limits of possibility with natural abrasives.

Although the choice of the proper grinding wheel for the general line of grinding operations common to the foundry does not require the extreme care necessary for a successful selection in the case of fine or precision grinding; nevertheless, careful consideration should be given to every detail of each operation.

With information to the effect that a certain wheel to run at a normal speed of 5,000 surface feet is required to grind cast iron, it is not always possible for a wheel manufacturer to supply the right wheel. The actual grade of the cast iron used should be specified in such a case. Stove castings, for instance, are made of a mix to produce a fine grain, even iron; machinery castings are often made of a similar grade. In a so-called job foundry the grade of metal will show greater variation and, as a rule, run coarser and harder. Other conditions being equal, it is found to be possible to use a harder wheel to grind fine sofe iron than is required for the harder, coarser metal, with equally rapid results.

The size and form of the castings, together with the amount of material to be removed, will also play an important part in the grading of such wheels.

GRINDING CASTINGS.

As a general rule, it is found that a wheel composed of carborundum of a grit represented by from 16 to 24 and bonded with a high or hard bond, will give excellent results for the grinding of cast iron. The coarser grit wheel is generally used on the heavier castings where large amounts of material are to be removed; the finer grit wheels for the smaller and lighter castings.

When malleable iron castings are to be ground the details of each operation should be more carefully considered than in the case of cast iron, as actual experiments have shown that the quality and texture of malleable irons met with in different foundries vary considerably. As in the case of cast iron, coarser wheels are used on the heavier castings and finer wheels on the smaller. With this material, as with steel, abrasives of the artificial aluminous class have been shown to give superior results to carbide of silicon for reasons already stated. On heavy castings grits as coarse as 8 and 10 are found to give the best results when bonded with a hard and tough bond. In some foundries it is a practice to grind or finish small malleable castings in the hard before they are annealed, and for this class of work the harder abrasive, silicon carbide, has been found to be superior.

For the grinding of steel it is generally found that a harder bonded wheel is required than for malleables. It is also found that a considerably harder wheel is required for use on a swing frame grinder than is required for a stand grinder operation. For the grinding of the general line of castings found in a brass foundry such extreme care in selection of a grinding wheel is not necessary, as the same wheel, properly selected, will take care of all kinds of such grinding, with the exception of perhaps straight aluminum or copper. For this class of work a softer wheel is essential.

As a general rule the grinding machinery used in foundries does not receive the attention which is necessary to the production of economical results. A loose bearing, or vibration in the spindle of a grinding machine is very liable to cause uneven wearing on the wheel. This uneven wearing of an abrasive wheel is often attributed to faults in the bonding, or unevenness in the wheel, whereas the actual source of the trouble lies in the grinding machine and not in the grinding wheel. Vibration in a machine spindle will reduce very effectively the life of a wheel, even though uneven wearing does not take place.

The peripheral speed of an abrasive wheel should also be kept as nearly constant as possible and the machine speed changed to produce this effect as the wheel is reduced in diameter by wear. The actual speed at which the wheel is operated should be as specified on the tags supplied with the wheels by the manufacturers.

It is also very commonly found that the use of the dresser is abused in foundry practice. Wheel operators are often allowed to dress their own wheels, and if the amount of material removed by such means was carefully checked up it would be found that more of the wheel was lost from this source than by the actual grinding operation. By placing the care of abrasive wheels under a competent man it has been shown in numbers of cases that an increase in the life of an abrasive wheel used as high as 150 per cent. can be obtained. If it is absolutely necessary to frequently dress a wheel it is obvious that the wheel is not suited for the particular operation, as a correctly graded wheel should not require frequent use of the dresser.

Another important feature is the necessity of providing sufficient power to a grinding machine to enable the wheel to retain its constant speed and not slack up as excessive pressure is applied on the work.

Finally, as abrasive tools and abrasives in general have now reached such a high degree of perfection, it is necessary that the same amount of care should be exercised in their choice and preservation as is commonly given to other precision tools.

(The End.)

STANDARD THREADS.

	IRON PIPE THD.		EASTERN HOSE THD.		PACIFIC COAST H. THD		NAT. STAND. HOSE THD.		PITTSBURGH GAUGE		BOSTON. HOSE THD	
	O.D.	PITCH	O.D.	PITCH	O.D.	PITCH	O.D.	PITCH	O.D.	PITCH	O.D.	PITCH
¼"	.840	14										
⅜"	1.050	14	1 1/16	11	Same E.H.T	Same E.H.T			1 3/16	11½	Same E.H.T.	Same EHT.
1"	1 5/16	11½	Same IPT	Same IPT	Same IPT	Same IPT					1 15/32	11
1¼"	1.660	11½	1 23/32	11½	1 57/64	11						
1½"	1.900	11½	1 31/32	11½	2 2/64	11						
2"	2.375	11½	2 36/64	8	2 19/32	10						
2½"	2.875	8	3 1/32	7½	3 "	7½ "	3 1/16	7½				
3"	3.500	8					3 5/8	8				
3½"	4.000	8					4¼	6				
4"	4.500	8					4¾	4				
4½"												
5"												
6"												
7"												

Pitch on 2½" Pacific Coast Thread varies from 7½ to 8.

The O.D. of the 2½" Pacific Coast Hose Thread varies from 3 to 3 1/32"

THE CUT SHOWS A COMPARISON OF DIFFERENT THREAD STANDARDS. THIS IS REPUBLISHED FROM THE ARTICLE ON STANDARD THREADS FOR HOSE COUPLINGS, BY P. W. BLAIR, IN THE MARCH ISSUE, AS THE FIGURES IN TABLE NO. 1 IN THE ARTICLE WERE INDISTINCT.

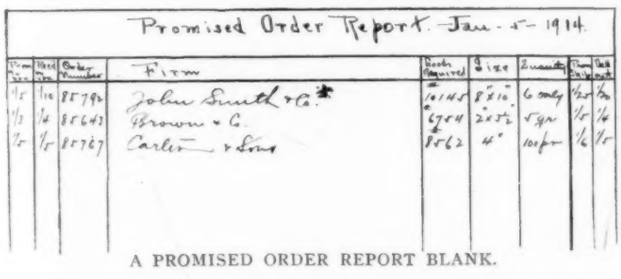
MODERN PLATING DEPARTMENT ORDER SYSTEM

A Description of a Method for Increasing the Efficiency of the Plating Room.

By Charles H. Fleischer.*

In a modern plating plant where a large number of orders are handled each day, the foreman has not only the solutions to keep in perfect condition, but the product must be sent out of his department in the same order it is received in. The oldest goods first except otherwise hurried by some member of the main office force. The author is of the opinion that the heads of large finishing departments have not given this subject proper attention. Every plater has been asked, "Why has this order been in your department so long?" In many cases he is unable to give a satisfactory answer. I know of some plating rooms where the orders are all over the department, consequently it takes some hunting before he actually knows if the order is in the plating room at all.

I believe there should be an order system, so that the foreman can tell by merely glancing at a card just how many orders he has in his department and how long they have been there, also number laid out and number waiting for goods to be refinished or replaced. He should also know at another glance the goods



A PROMISED ORDER REPORT BLANK.

promised to leave his department during the day. These points should be answered in a very few minutes. A system has been worked out where the clerk is financially interested in getting out his orders. A few cents will do more to get good service than hours of scolding. It must be remembered that we may enjoy our work, but the most important feature is our personal welfare. This is true of every man from the foreman down. Any system to be a success must be beneficial to both company and clerks. As I am a firm believer in the above statements, I have arranged a fine and bonus system in addition to their regular day rate. With this system my clerks do not have to be told which order to complete first. Have used the system described below for about six years and I firmly believe it to be a success.

Principles are as follows:

First.—Immediately after orders are received in the department they are dated and timed, then filed according to finish and order number. This making it possible for the foreman to determine how much work is ahead of any one man without looking over all the orders in his department.

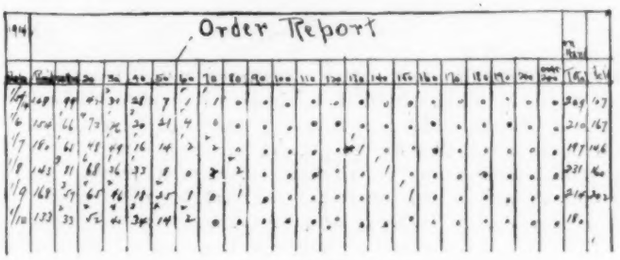
Second.—A working copy of these orders is put with the goods, this copy follows the goods through the various operations in the department.

Third.—After completion of each order the working copy is returned to clerk, who inserts date and time of completion, under date and time order was received. This copy is then filed in a cabinet for completed orders only.

*Foreman plater, Stanley Works, New Britain, Conn.

Fourth.—If part of an order has to be refilled or refinished, a shortage order and copy is made out calling for required amount to be refinished or refilled, dated and timed, then pinned to original order on file. Shortage copy to follow goods.

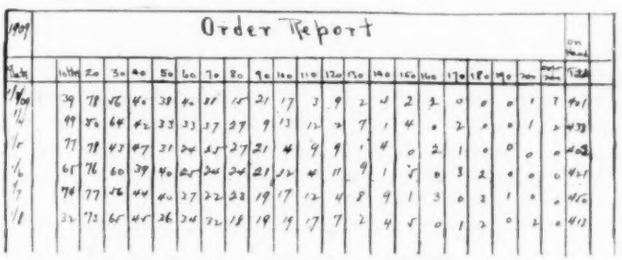
Fifth.—When shortage order is completed it is returned with working copy to clerk. Shortage copy is pinned to working copy and filed with completed orders. If it is necessary to make out a second or third



ORDER REPORT BLANK.

shortage the same method is followed. Foreman or members of the order department can readily tell the history of an order by looking at one of these copies —why and how long it is delayed.

Sixth.—In the front of our unfilled order cabinet we keep a card showing number of orders received each day, number sent out, number ten hours old, twenty, thirty, etc., and number on hand. In upper left hand corner of each space appears the number of orders waiting for shortage. By this card the foreman can see at once the condition of his orders and tell from day to day whether his department conditions are improving.



ANOTHER FORM OF ORDER REPORT BLANK.

BONUS AND FINE SYSTEM.

Seventh.

A.—One cent credit for each order of ten gross or less completed in ten hours after received.

B.—Two cents credit for each order of twenty gross completed in ten hours after received.

C.—Two cents fine if orders of certain sizes are not completed in thirty hours after received.

PROMISED ORDERS.

D.—All orders promised to leave department are entered on a card—a card for each day.

E.—Two cents credit on each promise kept.

F.—Two cents fine if not kept.

RETURNED ORDER FINE.

Eighth.—Two cents fine on each order returned to plating department on account of not being properly filled.

By the use of this system I have been able to reduce the time and number of orders in my department fifty per cent. and promises have had proper attention. It may seem to some that the bonus paid is money wasted, but experience has proved the contrary. Two order clerks are now doing the work of three and the results are better. They rush for the orders as soon as they enter the department, so they can get the bonus. There is but one thing missing to make this a perfect system, namely, a perfectly accurate clerk.

DETERMINING WEIGHT OF DEPOSIT *

SOME VALUABLE SUGGESTIONS FOR THE CHEMICAL DETERMINATION OF ELECTROLYTICALLY DEPOSITED METAL.

BY L. C. WILSON.

COPPER.

The next metal which is worthy of our consideration and study is copper, which stands high among the metals extensively used in electro-plating. Properly applied to iron and steel, it gives very good protection against corrosion, and finds extensive use. Further, the readiness with which it lends itself to the production of oxidized and other ornamental finishes and the ease with which it may be plated, tend to make it an extremely useful metal in many different ways. It deposits so easily on iron and steel that simple immersion of these in a solution of a copper salt is sufficient to produce a fair coating, without the use of an external electric current, although a deposit obtained in this manner is porous and inferior in some ways to that given in the regular process of plating.

Considering briefly the physical and chemical properties of copper, we note that it is a rather hard metal of a reddish color, although thin sheets transmit a greenish-blue, and bright metallic lustre. It is unchanged in dry air, but in the presence of water vapor gradually becomes covered with a layer of oxide or green basic carbonate. For this reason it is necessary to coat with lacquer, articles which are highly polished or buffed. Copper melts at about 1080 degs. C., a temperature somewhat higher than the melting points of gold and silver. As is well known, it is very ductile and malleable and readily admits of buffing, presenting a rich splendid appearance, somewhat like that of gold. When heated in the air to a fairly high temperature, a layer of cupric oxide forms upon it; cuprous oxide is formed at lower temperatures.

Nitric acid, either dilute or concentrated, dissolves it readily, copper nitrate, $Cu(NO_3)_2$, being formed. Dilute sulphuric acid, in presence of air, attacks it slowly; the hot concentrated acid forms copper sulphate $CuSO_4$, more familiarly known as blue vitriol. In general dilute acids do not attack it, unless air is present.

One property in which the plater is interested is the ready formation of the sulphide, CuS, by immersion in the soluble sulphides of ammonium or the alkali metals. In regular practice a solution of potassium sulphide, "liver of sulphur," is employed. When a clean piece of copper is dipped into this, it turns black almost instantly, in consequence of the formation of a thin layer of the sulphide.

Another peculiarity of copper, which is widely taken advantage of in electro-plating, is the fact that cupric cyanide, which is insoluble in water, is quite easily dissolved by potassium cyanide, forming a double cyanide $2\ KCN.Cu(CN)_2$, which is unstable and changes more or less completely to cuprous cyanide. The formation and use of cyanide copper plating solutions is in accordance with these reactions.

According to the conditions, therefore, copper is deposited either from an acid or alkaline, cyanide, solution. The former consists mostly of a solution of copper sulphate with a slight amount of free sulphuric acid present. A commercial basic carbonate or sulphate of copper is used for making the bath which is easily accomplished.

Such a solution, however, is not suitable for all purposes, since the free acid present attacks some metals and prevents deposition altogether or gives an unsatisfactory, powdery deposit. For example, zinc, iron or tin easily decompose copper solutions by simple immersion and are, therefore, best plated in a cyanide solution.

As indicated above, this consists of copper salts present as the double cyanide of copper and potassium or copper and sodium, together with certain other chemicals needed for the production of a good deposit. Since this solution is necessarily alkaline in reaction, it will not attack the objects to be plated and, incidentally, gives a fine deposit in considerably less time than required by an acid bath. Therefore, it is much used, although it is not entirely free from objectionable features.

METHODS OF ESTIMATION FOR COPPER.

Among the several different methods of estimating copper, there is probably none so accurate and convenient as the so-called iodide method. When carefully carried out, its results compare very favorably with those obtained by the electrolytic method, which is the most accurate known, but requires more expensive apparatus. The iodide method requires a standard solution of sodium thiosulphate, therefore weigh out about 19 grams of the pure crystals and dissolve in a litre (1000 c.c.) of distilled water. The solution must be standardized as follows: Weigh accurately about 0.2 grams of pure copper foil (which may be obtained at any supply house) and place in a small flask, about 6 oz. Dissolve by warming with 5 c.c. of a mixture of equal volume of strong nitric acid and distilled water, and then dilute to 25 c.c. Boil for a few minutes, to expel the red fumes as much as possible, then add 5 c.c. of strong bromine water. This is a solution of bromine in water and may be obtained at the supply house. In using it, be careful not to get any on the skin. Boil now, until the bromine is completely expelled, as indicated by the smell. The object of this treatment is to remove or destroy all red nitrous fumes by the addition of bromine and thus get rid of the latter, for it is just as harmful as the red fumes. Remove the flask from the heat and add a slight excess of strong ammonia; ordinarily, about 8 c.c. will be enough. Boil until the excess of ammonia is expelled, as evidenced by a faint odor or change of color, and add a slight excess of strong acetic acid. If necessary, boil again until any copper oxide or hydroxide which may have precipitated out, is re-dissolved. Cool down to room temperature and add about 6 c.c. of a solution of potassium iodide, KI, containing 50 grams of the salt in 100 c.c. of water. The solution at once turns brown, through the liberation of free iodine,

*Descriptions and illustrations of the apparatus needed to carry out the analysis described in this article are contained in an article by the same author, published in May, August and December, 1914.

while cuprous iodide is precipitated. The reaction between the copper acetate and potassium iodide may be represented as: $.2\ Cu(C_2H_3O_2)_2 + 4KI = Cu_2I_2 + 4KC_2H_3O_2 + 21$.

Clean out and rinse one of the burettes with distilled water. If it has a glass stop-cock, remove the tap and rub a little vaseline over it, then replace. Pour in a small quantity of the sodium thiosulphate solution, place thumb over upper end of the burette and invert so as to allow the liquid to flow all over the inside and take up any water which was in the tube. Drain off the liquid and fill with thiosulphate solution and let the excess of it run out until the lowest part of the curved surface at the top of the column, known as the meniscus, exactly coincides with the zero graduation mark.

Now add the thiosulphate solution to the flask, a little at a time, until the brown tinge has become quite weak, then pour in enough starch solution to give a decided blue coloration. Continue the titration cautiously until the blue color fades to a faint lilac, after which add the solution, a drop at a time, shaking or stirring, then letting stand a moment, after each addition, until the liquid loses all trace of its blue color. With a little practice the end point may be determined within a single drop. The burette reading is again taken from the meniscus, as explained above.

Since the weight of copper taken for analysis and the quantity of thiosulphate solution required to titrate the liberated iodine, are known, the value of the solution in terms of copper may be found by dividing the weight of copper in grams by the number of cubic centimeters of solution required. For example, suppose .1990 grams of copper were taken and 35.6 c.c. of thiosulphate solution were required, then $.1990 \div 35.6 = .0055$, therefore each cubic centimeter of the solution is equivalent to .0055 grams of copper. After the first few days, the solution does not change strength very rapidly, therefore, if kept in a dark, cool place it is necessary to standardize it only once every three weeks or so. It is very essential, of course, that the standardization be carefully done; therefore, at least until the operator is very sure of his work, it is better to run it in duplicate.

It may be of interest to know that the reaction between the thiosulphate and iodine is:

$2\ Na_2S_2O_3 + 21 = 2\ NaI + Na_2S_4O_6$, sodium iodide and tetrathionate being formed.

The starch solution may be prepared by making about 3 grams into a thin paste with water and pouring into 500 c.c., boiling water. Boil a few moments, let cool and settle. Pour off the clear liquid into a bottle and shake with a few drops of some essential oil, as wintergreen or cassia. Starch made up this way will keep indefinitely. If preferred, however, a small amount may be made up fresh each time.

THE ELECTROLYTIC METHOD.

Reference has already been made to the electrolytic method, which is very widely used for determining copper. As the name suggests, the metal is precipitated or plated by the electric current onto some object which is weighed before and after the operation, the increase in weight representing the amount of metallic copper present in the sample tested. It is extremely accurate and quite easily carried out that it may be well recommended to all who possess the required apparatus.

For this determination a platinum cone or wire screen and a wire spiral are generally used and may be obtained at any large chemical supply house, or the spiral may be made by the operator himself by taking a piece of heavy platinum wire six or eight inches long and coiling it in the shape of a hair spring, leaving one end project up from the center a distance of two or three inches. Just now platinum is very expensive, so it would be cheaper to use a gold wire and probably as good results will be obtained, although it has certain disadvantages. In fact, a silver wire may be heavily gold plated and made to give good service. This spiral is made the anode during the analysis and the screen receives the deposit.

When the screen and spiral are used, they may be supported in a beaker by ordinary clamps upon two ring stands or upon small wooden blocks, so that by withdrawal of these the beaker can be lowered and removed. By means of binding screws the platinum electrodes are connected to the battery or source of current.

Occasionally, however, the vessel containing the liquid is made the cathode and the metal is deposited on it. In this case the vessel may be made of platinum, gold or silver heavily plated with gold. The main requirement is to get a spiral or dish of some metal which is not attacked by ordinary acids or alkalis.

In this case the dish is made the cathode by being supported either upon the ring of the ring stand or upon any other convenient metal support which is connected to the negative wire from the battery. The anode, or spiral, which is held in a clamp, is lowered nearly to the bottom of the dish.

The source of current may be batteries, two or three Daniell or gravity cells being used, or the regular plating current may be employed, copper wires wrapped around the anode and cathode bars of a plating tank, serving to conduct it to the apparatus. In that case it is advisable to connect a delicate volt and ammeter in circuit together with a rheostat so that the proper conditions may be obtained.

The following exercise will acquaint the operator with the process and afford practice in the manipulation:

Weigh out about 1.5 grams of pure copper sulphate into a beaker, dissolve in 200 c.c. of distilled water and add about 2 c.c. strong nitric acid. Stir gently with the platinum spiral, finally leaving it in the beaker.

Previously, the cone or screen should be cleaned by immersing for a moment in hot potash, rinsing in distilled water, then in alcohol and drying in a hot oven and finally weighing. Care must be taken that nothing touches it, not even the fingers, after it is dry. The screen is then lowered into the liquid over the spiral, taking care that they do not touch each other.

They are now connected to the source of current, the cone being connected to the negative or cathode side. A current of .5 to 1 ampere is passed through the solution. Care must be taken that all contacts are perfectly clean so as to insure good connections. If the operation is carried out in a platinum dish, it should be covered in order to prevent any of the liquid from being carried off in the form of fine spray with the gas which escapes from the anode. For this purpose, either a watch glass with a small hole bored in the middle to allow the wire to project through, or an inverted funnel of such a size that the mouth will just go inside the dish, may be employed.

The copper gradually deposits on the cathode and the solution becomes paler and paler until it finally appears colorless. Since it ordinarily requires several hours for the completion of the operation, it may be allowed to go on over night. Naturally, a stronger

current would hasten the deposition considerably, but the deposit is apt to be "burned" and less coherent, so that there is danger of losing some while washing.

If it is seriously desired to cut down the time required for deposition, arrangements should be made to rotate one of the electrodes. This procedure, without increasing the current, produces a fine deposit in much less time than otherwise required. The writer will not attempt to describe the device for accomplishing this, beyond remarking that ordinarily the electrode is connected to a small pulley, working in a bearing suspended over the beaker or dish. A small electric motor will furnish the power.

To determine whether the metal is all out of solution, one or two drops of it are withdrawn by a pipette and touched with a drop of potassium sulphide solution (copper oxidizing solution). Absence of a black color is evidence that no copper is present.

The cone is carefully raised out of the liquid, or the beaker lowered and removed by withdrawing the blocks, without breaking the current, and washed thoroughly by a jet from the wash bottle. It is then dipped once or twice into strong alcohol, placed in a hot oven for a few minutes or dried by holding it high above a gas flame, and weighed, after allowing to cool.

The gain over the previous weighing is the weight of pure copper in the sample taken and from this the per cent. may be easily calculated.

For example, the following data was taken in an analysis of commercial copper carbonate:

Weight of salt taken, 1.5 g.

Weight of cone after electrolysis.....	25.7243 g.
Weight of cone before electrolysis.....	25.0143 g.
Weight of copper.....	.7100 g.

$$\frac{.71 \times 100}{1.5} = 47.33 = \text{per cent. of copper in the sample.}$$

(To be continued.)

SILVER SOLUTION ASSAY

A Simple Method Capable of Being Run by the Average Plater.

By E. J. Hall.*

So many methods for determining silver in plating solutions are in use, or have been proposed, capable of giving more or less accurate results that to present another presupposes something of merit. Before detailing the method it may be desirable to give the present schemes a cursory inspection.

The electrolytic method is accurate only when other metals capable of precipitation under the same conditions as silver are absent. This is not true in silver-copper strike solutions, or plating solutions following such a strike, as some copper is always carried over with the work. It is not rapid and requires expensive equipment. Precipitation of the silver as chloride is open to the objections that a large excess of HCl must be used and the solution boiled for a long time to convert the silver cyanide formed at first to silver chloride. The solution must then be diluted to reduce the solvent action of potassium chloride on the silver precipitate and allowed to stand over night. If the precipitate is filtered on paper, instead of a gooch crucible, and treated in the proper way the method becomes tedious.

Evaporating the solution to dryness and fusing the residue with various fluxes is a slow process and gives low results unless contaminated by other metals, as do the methods where the silver is reduced to the metallic state and cupelled. Precipitating the silver with metallic zinc, filtering, dissolving in nitric acid and titrating with thiocyanate gives good results if all the silver is thrown down and well washed. There is, however, frequently considerable difficulty in precipitating all the silver.

While the above methods are probably sufficiently accurate to meet the requirements of platers, the following method has proven so convenient and exact that it is considered worth publishing. It can scarcely be called new, except possibly in detail, as it is a modification of the thiocyanate process.

THE PROCESS.

To carry out the assay, measure one troy assay gallon,† 12.17 c.c. (12.2 c.c. will usually be close enough), into a wide-mouthed flask, 250 to 300 c.c. capacity (known as copper flasks), add 10 c.c. of concentrated sulphuric acid and evaporate to SO_3 fumes. This can be done very rapidly if the flask is held in an inclined position, to prevent loss by spattering, with a pair of tongs and given a circular motion over a free flame, causing the contents to rotate. It will be noticed that the silver cyanide which forms at first soon dissolves, but a residue of silver chloride may remain, which is more difficult to decompose. To effect the dissolution of the chloride, boil the sulphuric acid, heating the flask supported on a wire gauze in an inclined position, till no residue remains, which may take five to ten minutes, depending upon the amount of chlorine in the solution. Allow to cool, dilute to 100 c.c., add 1 c.c. of a saturated solution of ferric alum and titrate with a solution of potassium thiocyanate containing approximately 9.05 gms. per liter, or of ammonium thiocyanate 7.1 gms. per liter. When the first permanent pink color appears the flask should be agitated violently, as the precipitate may occlude silver which has been unacted upon and the liberation of this silver may remove the color. Titrate until the color cannot be discharged by agitation. The number of decigrams (0.1 gm. or 100 mg.) will be troy ounces per gallon of solution.

To standardize the solution exactly, weigh out about 5 decigrams (500 mg.) of silver, dissolve in flask with nitric or sulphuric acid—the former is more rapid—and titrate as indicated in assay. The number of c.c. used divided into the weight of silver gives the standard which should be expressed in decigrams. If the standard solution is adjusted to such a strength that 1 c.c. equals 0.1 decigram (10 mg.) shifting the decimal point in burette reading one place to the left will give ounces per gallon.

The principal objections to this method are the large quantity of SO_3 fumes evolved requiring a good hood and constant attention if rapid evaporation is produced over a free flame. Still the accuracy and rapidity of the method compensate for these features. An assay can readily be made in less than half an hour. If a beaker is substituted for the flask, rapid evaporation without bumping will be facilitated by introducing a 3-millimeter glass tube sealed with a blow-pipe flame one-eighth of an inch from the lower end, leaving a small cavity.

*Professor of Assaying Dept. of Metallurgy, Columbia University.
†Published in The Metal Industry, November, 1914, p. 466.

HOME-MADE MOLDING MACHINES

SOME SAGE ADVICE REGARDING SELECTION AND USE OF FOUNDRY APPARATUS.

BY W. H. PARRY.*

Many foundrymen would, in the natural course of events, install molding machines, but are deterred from so doing by the scandalous prices asked for many for the most successful makes. A story is told, and I happen to know that it is a true one, that a molding machine salesman, when asked the price of a certain machine, had the colossal nerve to name four hundred and ninety dollars as the figure. The prospective buyer waxed indignant and threatened to throw the salesman out of the place for displaying such gall. He was pacified, however, by the statement of the salesman to the effect that as he was working strictly on commission, his share of the swag was only twenty per cent. of the whole, and as the machine cost twenty-four dollars to build it was no more than just that his house should make a "fair profit" on such a machine.

Now, let us look into this matter and see what this salesman meant by "a fair profit." Twenty per cent. of four hundred and ninety dollars is ninety-eight "iron men." That is what the salesman got for his share. The machine had a shop cost against it of twenty-four dollars and let us assume that twenty-four dollars more would cover the overhead expense; then the house pocketed three hundred and forty-four dollars as their share of the hold-up. Now, far be it from me to expose the tricks that molding machine makers pull off on their unsuspecting customers in the way of charging excessive prices for very ordinary machines, but I will go so far as to state that there comes a time when owners and managers of plants, who have sized up this matter, finally arrive at the conclusion that all things considered it is a paying proposition to make your own machines and so I would advocate this very thing.

Suppose we start with the plain hand squeezer type of machine that the market is infested with and which can be bought at prices varying from twenty to sixty dollars. They are simply a lot of cast iron thrown together with the very minimum amount of machining on any part and if a battery of say ten or twelve are needed it will pay to make them.

Next we have the stripping plate machine. And when a foundryman, who knew what he was talking about, claimed that it cost more to mount patterns on such a machine than the machine cost he handed the makers of this type of machine an awful jolt, because he told the truth.

Yet on "long run" jobs of the kind that this machine is adapted for, it pays to use them.

There is no great skill required to design a stripping plate machine, as any combination of levers and guides that will produce a reciprocating motion will answer for this type of machine. As a matter of fact, the patterns themselves very often provide all the guiding necessary for stripping plate work. The jolt or jar ram machines now on the market are actuated by both compressed air and cams, the latter being either belt or electrically driven, and a very little study of their mechanisms will prove how very easy it would be to duplicate such machines, without, in any way, being liable to a suit for infringing on the supposed-to-be valuable patents. In reality most of the patents on this type of machines are not worth the paper they are printed on as they have their origin from the shows of foundry equipment, where it is a known fact more alleged patents are "acquired" than shown.

*Superintendent, National Meter Company, Brooklyn, N. Y.

Did you ever note the actions of the inventors at these shows? Well, if you have not, just make it your business to watch the stunts they pull off on one another the next time you attend a show. If you do not say that anybody with a really good thing in the molding machine line, who is foolish enough to exhibit it publicly, will find his machine copied, lock, stock and barrel, when the time for the next show rolls around, then you are not a very keen observer.

The success that many really great concerns have made of their business can be, in a great measure, laid to the fact that they, at the very outset, made their own molding machines to suit the peculiar requirements of their work. The Singer Sewing Machine Company has used a type of molding machine designed by its engineers at a time when, with a foundry full of molders, they could not produce enough castings by the hand method to meet their requirements. This machine is not for sale to the general public, though it is a pity that other foundries cannot use it, as it is an enormous producer.

The Atlas Engine Works, of Indianapolis, Ind., molded every casting from the governor balls to the largest engine bed on their own make of molding machine. It was known as the "rubber bag" machine, and to see the extent to which they carried out the molding machine idea in their foundry can be better appreciated when it is known that in that enormous plant there were but two molders employed, all of the molding machine hands being but ordinary laborers. This machine was sold to anybody that could pay the price, and at that time was considered a great machine; in fact, far in advance of anything invented up to that period, which was in 1904. It was an expensive tool to build, yet this concern did not hesitate to spend their good money in building enough of them to fill its foundry, knowing that in the end they were bound to win.

There are many machines now on the market that are so designed that by some hook or crook they will catch the eye of men who are not foundrymen, but who are superintendents and managers of plants and do not know enough about foundry work to keep themselves warm. These machines are usually of the automatic variety and to the uninitiated they are very impressive in operation, but the poor fellow who falls for this type of machine either loses his job because he bought it, or kicks himself for a month of Sundays when he finds out how easy he fell.

Most half-baked managers and superintendents of large plants, who landed their jobs because some member of the firm or one of the biggest stockholders married their sisters, are easy meat for the molding machine makers, particularly the makers of such machines as those where the sand enters one end, and after being tantalized to death comes out of the other as finished molds. Such machines have a thousand or more moving parts, which means that the odds against the machine moving continuously and without hitch are at least "a thousand to one" and that is some odds to overcome, believe me.

So if you would be successful and happy in your own foundry make your own molding machines.

Builders of molding machines are invited to criticize Mr. Parry's views and "The Metal Industry" will be pleased to publish such letters.

EDITORIAL

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CONTENTS

ZINC OR SPELTER?

Recent developments in the metal market have revealed one of the real reasons for the mysterious fluctuations in the price of the metal with the "Dr. Jekyl and Mr. Hyde" name. The European war, of course, was responsible for the first upward rise in the price of zinc, but as a matter of fact prices soon rose to a point which even the demand, sharp as it was, did not justify. That this was so was proved by the fact that prices just as suddenly dropped in some cases as much as two cents per pound. The reason for this "over the war price limit" was due to the action of the mines in boosting the price of *ore* to a point where it became unprofitable to reduce the metal even at the highest market prices. The consequence was that consumers stopped buying, smelters stood pat and pretty soon the ethiopian in the Calamine ore heap was smoked out and down went the prices. Now things are at a better level with prices at 9.50 cents per pound for galvanizers, 12 to 15 cents for brass special and 16 cents for the better grades.

WHAT'S IN A NAME?

It seems to us that now is as good a time as any to start a little argument about the double name of zinc. "When it is in cast form it is 'Spelter,' when in manufactured it is 'Zinc,'" says one authority. This may be so as far as it goes, but that is not so very far after all, because the ornaments made of the metal in slush molds are called spelter because they are cast, but they are also manufactured so there's the rub. We should think that now when the metal is so much in the public eye that it would be just as well to drop the term spelter and call the metal by its real name, zinc. We do not have two names for other metals, as, for instance, gold, silver, copper or tin. Zinc is just as true a metal as any of the others so why treat it as a puzzle? As we have said before the name spelter* is an English contraction of the ancient word "Spiauter," meaning to fume or smoke. By the same token antimony and cadmium could also be called spelter!

The metallurgist, when he makes out a ticket for the melter or caster, does not specify that so much "spelter" shall be used; he writes Zn on the ticket, meaning zinc. The chemist when reporting the analysis of a piece of metal does not enter spelter upon his report certificate, he says that the sample submitted contains so much iron, so much cadmium, so much aluminum and so much zinc. So why continue to call it by an ancient name? The American Society of Testing Materials when they formulated the standard specification for the metal in 1911 called these specifications as for spelter, but what

*THE METAL INDUSTRY, January, 1910.

they should have done was to call it virgin zinc, as they called copper virgin copper. These specifications, by the way, are now being used by both seller and buyer and in order to make it clear to some who do not understand the various grades of slab zinc now in the market we will publish the standards as they are now in force.

STANDARD SPECIFICATIONS FOR CAST ZINC.

1. Under these specifications Virgin Spelter, that is, spelter made from ore or similar raw material by a process of reduction and distillation and not produced from re-worked metal, is considered in four grades, as follows:

A.....	High Grade.
B.....	Intermediate.
C.....	Brass Special.
D.....	Prime Western.

2. A brand shall be cast in each slab by which the maker and grade can be identified.

3. The maker shall use care to have each carload of as uniform quality as possible.

4. A. High Grade.—The spelter shall not contain over

0.07 per cent. lead.
0.03 " " iron.
0.05 " " cadmium.

It shall be free from aluminum.

The sum of the lead, iron and cadmium shall not exceed 0.10 per cent.

B. Intermediate.—The spelter shall not contain over

0.20 per cent. lead.
0.03 " " iron.
0.50 " " cadmium.

It shall be free from aluminum.

The sum of the lead, iron and cadmium shall not exceed 0.50 per cent.

C. Brass Special.—The spelter shall not contain over

0.75 per cent. lead.
0.04 " " iron.
0.75 " " cadmium.

It shall be free from aluminum.

The sum of the lead, iron and cadmium shall not exceed 1.20 per cent.

D. Prime Western.—The spelter shall not contain over

1.50 per cent. lead.
0.08 " " iron.

ZINCING, NOT GALVANIZING.

The term galvanizing as at present applied to the process of coating iron or steel with zinc is also not correct. This should be called zincing. When we coat copper, for instance, with tin or steel with copper or brass we call it tinning, coppering or brassing, so why not zincing? In the correct sense galvanzing means "to shock as by a galvanic current." Possibly to the cold zincing process where electricity is used, galvanizing might be applied, but copper, nickel or silver-plating is also galvanizing in the same sense.

We have simply grown used to associating the use of the metal zinc with the word galvanizing and it has become the accepted term by virtue of usage. There are now in use five separate and distinct methods of galvanizing: The hot process, where the metal to be coated is dipped into a molten bath of zinc. The cold process where a bath of zinc salts with zinc anodes are used with electric current. The process of Lohmanizing where the metal is dipped into an intermediate bath containing mercury before the electric bath. The process of Sherardizing, where the metal is buried in zinc powder and heated. The process known as Shoop's process where the zinc is sprayed on the metal by means of a pistol. It seems foolish to include all these processes under the head of "galvanizing," so why not zincing?

ELECTRO-PLATERS' CONVENTION

Advance reports from the committee in charge of the annual convention of the American Electro-Platers' Society to be held at Dayton, Ohio, in June, indicate that it will eclipse all past performances. At this writing we are not provided with any of the details of the program arrangements. There is no doubt, however, that the efforts of the enthusiastic and energetic men who compose the committee that nothing will be left undone to ensure complete success. We believe that now is a good time for everybody to start to boost the convention, and it would be a good idea for every employer of a plater to keep the date, the first week in June, in his mind and figure on allowing that period of time as his plater's vacation so he can go to Dayton and aid in making electro-plating history.

CORRESPONDENCE

WE CORDIALLY INVITE READERS' OPINIONS AND CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY

BANQUET ORATORY

To the Editor of The Metal Industry:

I want to thank you for the editorial in this month's issue of The Metal Industry, Re the Electro-Platers' Society. I thoroughly agree with you that subjects at banquets to be of value should be debatable and that the speakers should by all means be chosen from the particular branch which holds the meeting. Of course, an occasional "speech" by such men as Prof. Richards, Dr. Lukens and others of their kind is desirable, but we need most of all discussions on "shop problems" by practical men and as you stated in a previous editorial for attending the Electro-Chemical Society's meeting to which the American Electro-Platers' Society were invited. You said: "The language of the chemist is not the language of the plater. And until the plater can understand the language of the chemist the purpose is best served by speakers of practical experience, and of a nature that is debatable."

In this month's Review of the American Electro-Platers' Society you will notice in my comments I suggest to the supreme officers having in charge the coming convention in Dayton, Ohio, to appoint more than one speaker for any one subject. So you see "great minds run together."

Joseph Walters.

Richmond, Va., March 5, 1915.

NEW BOOKS

LABORATORY COURSE IN ELECTRO-CHEMISTRY.—By Oliver P. Watts, Ph.D. 5½ by 7¾ inches. 150 pages, including index. 16 illustrations. Bound in cloth. Published by the McGraw-Hill Book Company. Price $1.00. For sale by THE METAL INDUSTRY.

This laboratory manual has been designed primarily for use in the author's classes in the University of Wisconsin, and embodies the notes originally prepared by C. F. Burgess, former head of the Chemical Engineering department of the University, together with many new experiments and much additional material.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY.

ALLOYING

Q.—Can you furnish us with a good composition of phosphor bronze to be used for springs and bearings?

A.—A good mixture for phosphor bronze for springs is as follows:

Copper	95	per cent.
Tin	4.5	" "
Phosphor tin 5 per cent	0.5	" "

For phosphor bronze of the highest possible strength the following mixture is recommended:

Copper	90	per cent.
Tin	9	" "
Phosphor tin 5 per cent	0.1	" "

The alloy made according to this formula is poured into ingots and then remelted into sand castings. The remelting increased the strength.

For ordinary work when a medium strength is required and when the scrap is used again the following mixture is recommended:

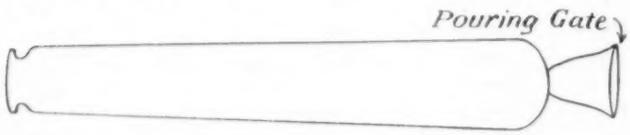
Copper	80	per cent.
Tin	8	" "
Lead	10	" "
Phosphor tin 5 per cent	2	" "

Zinc should never be used.—P. W. B. Problem 2,121.

CASTING

Q.—We have a large number of handles to cast on the blades of small knives. Will you kindly advise us of a good mixture of aluminum and zinc to use in these? Also how you would gate the mold, etc.? Would heating the mold, if made of iron, help any or would you suggest the use of tallow, or any other substance to rub the mold with? It does not matter if the handles are slightly hollow so long as their shape is run up full.

A.—In casting handles on blades of small knives would



advise the use of iron molds and gate on the ends, as per sketch.

Heat the mold well before pouring the handles. This can be best accomplished by pouring several molds without the knives and until the handles will cast smooth, then cast the knives in the handles. Remove from the mold as soon as possible and dip in water. A mixture of 66⅔ per cent. of aluminum and 33⅓ per cent. of zinc will cast very nicely. However, for this grade of work would suggest the use of No. 12 aluminum alloy as a zinc and aluminum alloy will tarnish and become discolored. No tallow or other substance is necessary to rub on the mold.—W. J. R. Problem 2,122.

CLEANING

Q.—We shall be glad if you will kindly give us a method of cleaning small zinc stampings to give them a polished white finish. We can get the desired results by dipping a few on a wire, but when we wish to do a quantity in a stone-ware dipping basket, they become heated through the action of the acid and turn black.

A.—We suggest that the small zinc stampings be tumbled to produce a clean white surface in a regular vertical tumbling barrel, using a very dilute solution of Oakite and sal ammoniac for the purpose. The following proportions should give good results:

Warm water	1 gallon
Oakite	1 ounce
Sal ammoniac	¼ to ½ ounce

If the stampings are not sufficiently white we suggest that they be immersed in a solution consisting of 1 gallon of water (160 degs. Fahr.) and ½ to 1 pound of sal ammoniac before tumbling, as stated above. This dip will remove any oxide upon the surface of the zinc and may be used continuously until saturated with zinc, then a new dip should be prepared. The above combinations should give you the desired results without the use of the strong mineral acids.—C. H. P. Problem 2,123.

DIPPING

Q.—Will you kindly let me know the best dip for gilder's metal? One that will bring the metal out in its true color so that in the enameling of it we will be able to get the best color with red enamel.

A.—The best method of producing a very bright finish upon gilder's metal by acid dips is as follows:

First: Cleanse the articles from grease in the usual manner, then immerse in clear aqua fortis (38 per cent.) for a second or two, wash in clean water and boiling water.

Second: Now immerse in the potash or soda cleaning solution and allow to dry without re-washing in water.

Third: Afterwards immerse in the bright dip for a second or two. This dip should consist of three parts by measure of 38 per cent. aqua fortis, 1 part of 66 per cent. oil of vitriol, ½ part of water and 1 ounce per gallon of the mixed acids and water. A small amount of scrap copper should be dissolved in the acids previous to using and the bright dip should be quite cool, otherwise it will act upon the metal too rapidly and produce a dull finish instead of a bright lustre.

Sometimes a second immersion in the potash dip and then again in the bright dip produces a very high lustre. After acid dipping and washing a very dilute cyanide dip should be prepared and the bright dipped articles should be passed rapidly through the cyanide dip in order to remove any acid stain that might form on the articles. Afterwards wash and dy out in the usual manner.—C. H. P. Problem 2,124.

MELTING

Q.—Can you give us any idea of the difference in loss and cost between an air furnace and crucibles in the melting of scrap copper wire for the production of ingot metal? Our crucibles melt about 180 pounds, but we want, if possible, a draught furnace to melt 10 hundredweights. We are informed that the crucible way of melting is cheaper than the tapping furnace, because the copper, when melted in the latter, apart from the soaking of the metal in the bricks, has to be poured again in a hot crucible before putting in the molds, and the cost of coal, etc., is supposed to be dearer than the coke method.

A.—A draught furnace for melting copper wire should not be a tapping furnace, but should be arranged so that the copper can be ladled directly from the furnace into the molds. It should have a capacity of about 200 hundredweights. It is true that the bricks of the furnace will soak up a certain amount of copper in the first few heats, but it is finally recovered. Cuch a furnace has the advantage that the wire can be charged easily whatever may be its shape, while for crucible melting, it has to be cabbaged. There is no loss of copper in the draught furnace as any copper that is oxidized is again reduced by the poling operation and any slag formed

may be smelted again. In the crucible melting the loss on clean wire is about 1 per cent., more or less, depending on its fineness and the ingot is inferior, this being especially the case with fine wire. The draught furnace for copper should have a basic lining.—J. L. J. Problem 2,125.

PLATING

Q.—Is there a blue gold solution? If so, how is it made? I understand it is being used on brass jewelry and I would like to try it on gold.

A.—Blue gold in the alloyed state consists of 18 parts of fine gold and 6 parts of iron. In preparing a blue gold solution the chloride of iron, dissolved in cyanide, should be added to the regular gold solution until the blue tone is produced. This would have to be determined by experiment. Probably phosphate of iron would give better results.—C. H. P. Problem 2,126.

Q.—Can you tell me how to find the correct size of dynamo needed according to the number of gallons of solution used? I am running five two hundred gallon tanks of nickel and one two hundred gallon tank of copper and using a four volt dynamo, but I am unable to tell what amperage it is.

A.—It is difficult to determine the size of the dynamo required, based upon the gallons of solution. The amperes required are determined by the amount of surface to be plated at one time and the variety of the solutions to be operated.

Plating dynamos are frequently marked according to their size by volts and watts, instead of the amperes. The volts multiplied by the amperes gives the watts. If your dynamo is rated at 4 volts and 2,000 watts it would develop 500 amperes at 4 volts, acccording to the following example: 4 volts multiplied by 500 amperes equals 2,000 watts. If the dynamo is only marked by the volts then it would be advisable to correspond with the manufacturer, sending them the size and number of the dynamo with a request for the number of amperes developed at its given speed.—C. H. P. Problem 2,127.

TEMPERING

Q.—We wish to inquire as to whether you know of any substance that could be used in a heating bath in place of lead, where lead is used for heating steel for hardening such as is used on small tools. This material could be lighter in weight so that the steel when placed in it would sink, but not float on top, as it does in the case of lead. At the same time, this material must not have any effect on the steel, such as either carbonizing or de-carbonizing it, and also a material that would not have a tendency to waste away fast when kept at a heat of 1,600 to 1,700 degrees.

A.—For use in tempering where the temperatures are not high, as in tempering carbon steel, a mixture of one-third potassium chloride and two-thirds sodium chloride may be used. This is not satisfactory, however, for high speed steels that must be tempered at 2,200 degrees Fahrenheit as irritating fumes are given off and the mixture attacks the containing vessels very strongly.—J. L. J. Problem 2,128.

TINNING

Q.—We seem to have trouble in having our tinned articles turn different colors after taking them out of the tin. They are bright enough when we first take them out, but after cooling a rainbow effect appears. We have tried dipping the articles in cold water and also in the chlorides of zinc solution. The latter seems to produce an even finish but spoils the lustre. Perhaps you can advise us what to do to hold the bright effect so common in all new tinware.

A.—To prevent the formation of colors upon the tinned surface instead of using water for cooling use a bath of kerosene oil. Then dry out by the aid of maple or other hard wood sawdust. This will give you a bright surface without the colors noted. Cooling also in a hot solution consisting of one gallon and two to four ounces of sal ammoniac also gives a clear bright surface to the tin, but the kerosene oil and sawdust is more frequently used.—C. H. P. Problem 2,129.

TUMBLING

Q.—How can we, by means of tumbling or otherwise, obtain a bright polish on small steel parts, whose surface has become blackened in the process of hardening?

A.—To remove the carbon black developed in the hardening of small steel pieces we suggest that you tumble them with emery and water, adding about two ounces of sodium carbonate to each gallon of water. No. 60 emery will probably answer the purpose best, but if the surface of the steel, after tumbling, appears coarse use No. 100.

After this preliminary tumbling wash the pieces in water and dry out and finish tumbling in leather scraps, adding to the scraps a small amount of flour emery mixed with a small amount of lard oil. We believe these methods will give you a satisfactory finish.—C. H. P. Problem 2,130.

VARNISHING

Q.—Will you kindly advise us of a good pattern varnish used on wood patterns that will dry quickly, have a smooth surface and that readily draws from the sand. The patterns are used repeatedly.

A.—Yellow shellac varnish is generally used. It is made by dissolving gum shellac in grain alcohol. Wood alcohol is sometimes substituted, but it is inferior. The color of the varnish is changed for covering core prints in order to readily distinguish the prints from the body of the pattern.

Black shellac varnish (which is the color generally used) is made by the addition of lamp black and this should be of good quality and free from grit. Red varnish can be made for use on the core prints of wood patterns by adding chinese vermillion. All coloring powders should be well pulverized and at least three coats of varnish should be applied to patterns that are used considerably, the surfaces being rubbed down with sand paper after applying the preliminary coats in order to obtain a smooth surface.—P. W. B. Problem 2,131.

ZINCING

Q.—Will you kindly advise us and assist us in overcoming the trouble we are having in galvanizing by reason of oxidation or thickening up of the zinc. We have been melting this zinc to a fluid condition, dipping small steel pieces in muriatic, cut down with zinc as for soldering and then into the molten zinc, with apparently good results except that in a short time the metal commences to thicken at the bottom, gradually increasing until some mornings when we melt it we can not get it fluid.

We have been advised that if we added a small quantity of aluminum it would prevent this action. The quantity mentioned was about 1 ounce to 100 pounds of spelter. We have tried this treatment, but did not appear to be having much success. We find that the melting point of aluminum is about 1,200 degrees Fahrenheit, while zinc melts at about 900 degrees Fahrenheit. Should we melt the aluminum by itself and then add to the melted spelter? When adding a handful of small scrap pieces of aluminum to the molten spelter it did not appear to us to be melting. It was impossible to mix it in through the molten metal and it finally was floating on top and had the appearance of so much brown sand. Possibly this was the oxide that it had taken from the spelter and that it had commenced to do the work.

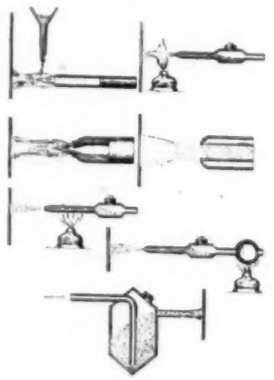
A.—The thickening up of your zinc is due to the formation of zinc-iron alloy or dross. It should be removed about once a week by means of an iron spoon with a long handle. The bowl of the spoon should be perforated with ¼-inch holes to allow the clear zinc to drain away from the dross. The dross can be sold for about 80 per cent. of the cost of new spelter. Aluminum may be added to the zinc by making an alloy of 98 per cent. zinc and 2 per cent. aluminum in a graphite crucible and pouring into sticks. This alloy will dissolve in the zinc.—J. L. J. Problem 2,132.

PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY

1,128,059. February 9, 1915. **Method of Plating or Coating with Metallic Coatings.** Max Ulrich Schoop, of Hongg, near Zurich, Switzerland, assignor, by Mesne assignments, to Metals Coating Company of America, of Boston, Massachusetts, a corporation of Massachusetts.

This invention relates to the method of plating or coating with a metallic coating, similar to electro-plating, by projecting small particles of the metal that is to form the coating, onto the object to be coated, as shown in cut.



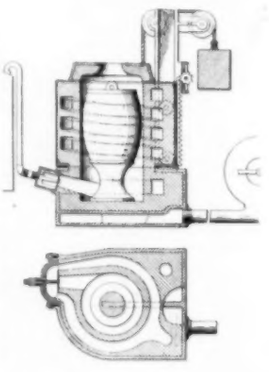
According to the present invention the starting material is not liquid metal, but metal oxid, metal powder or dust, which is projected upon the article to be coated.

For a better understanding of the invention it may be stated that if a lead ball is thrown against a stone plate it will be heated and mashed flat. If such a ball be given sufficient impetus, for example, if it be shot from a gun against a smooth hard plate, the heat generated by the impact will melt the lead, and the plate will be coated with a strongly adhering coating, not only at the point of impact but also over a considerable portion of the surrounding area, bordered by radiating lines of the lead.

When using metals having a high melting point, it is desirable to warm or heat the metal powder in its container before projecting it onto the surface to be coated, or to use a heated propelling medium, or to heat the article that is to be coated, provided the nature of the article permits it.

1,129,983. March 2, 1915. **Crucible Furnace.** F. M. Iler, Denver, Colorado.

This invention relates to melting furnaces and more particularly to a hydrocarbon-burning crucible furnace, in which metals and their alloys may be melted.



It has been the practice to mix the hydrocarbon fuel, such as oil, gas and the like, with a cold air blast coming directly from the blower.

One of the objects of this invention is to pre-heat the air by utilizing the heat conducted through and radiating from the walls of the melting chamber. The pre-heated air mixed with the oil and the like thereby affords a more thorough mixing of the fuel and air and a more complete vaporization of the oil. The arrangement, as shown in cut, also serves to keep the outer walls of the furnace cool.

Another object is to provide a construction which will facilitate the removal of the crucible while hot and containing a charge of molten metal.

1,131,578. March 9, 1915. **Varnishes and Other Like Materials and Process for Producing Same.** Alfred B. Walker and Franklin P. Walker, of Cincinnati, Ohio, assignors of one-half to William R. Wood, of Cincinnati, Ohio.

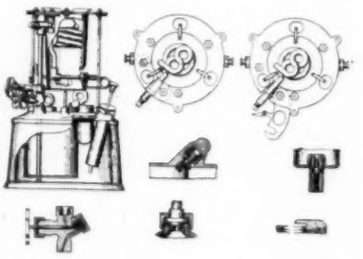
This patent covers a liquid varnish characterized by an absence of gums or resins, comprising a solution of a metallic soap and a base, the metal of which belongs to a group other than that of which the soap metal is a component, the said soap and base having the property of forming a liquid when heated together.

A primary varnish base comprising a solution of an aluminum soap with an oxid of the alkaline earth metals, reduced to substantially solid condition and soluble in a suitable varnish carrier.

The process of making liquid varnish which consists in chemically uniting a metallic soap having an acid characteristic, with a metal hydroxid, and eliminating the water of combination liberated by the reaction.

1,130,133. March 2, 1915. **Plumbers' Furnace.** A. J. Archambault, Chicago, Ill.

This invention has for its object to simplify and improve the construction of plumbers' furnaces so as to permit repairs to be made easily and conveniently and permit ready inspection of the interior of the fuel conduits and valves.



A further object of the invention is to produce a simple and novel construction which will permit the burning of kerosene without the annoyance and delay incident to starting with kerosene as a fuel.

A further feature of invention consists in a small cup-shaped chamber or compartment, as shown in cut, extending downwardly from the top of the main reservoir into the interior thereof and provided with a detachable cap; the chamber or compartment being adapted to contain small repair parts for the furnace.

One of the objectionable characteristics of the ordinary plumber's furnace is that whenever there is anything wrong with the burner or the conduits or valve connected therewith, an almost complete dismemberment of the furnace is required in order to permit the difficulty to be located.

The most important feature of the present invention consists in a novel construction and arrangement which permits the parts where trouble is apt to occur to be easily inspected or even removed entirely without dismantling the furnace or any considerable part thereof.

1,130,785. March 9, 1915. **Aluminum Alloy.** Alfred Wilm. Schlachteusee, near Berlin, Germany.

This invention relates to improvements in aluminum alloy. The inventor has found that a valuable improvement in aluminum alloys will result by combining small quantities of manganese, with aluminum, magnesium and copper, the properties of the resultant alloy being very advantageous as compared with anything heretofore known, and at the same time these properties are capable of modification according to the proportions of the manganese combined in the alloy. But the alloy is particularly advantageous when the percentage of magnesium is two per cent. or below. An addition of manganese, for example, to an alloy of 93.1 to 96.5 per cent. aluminum, 0.5 per cent. magnesium, 5.6 to 3 per cent. copper, causes, even with an addition of only 0.5 per cent., an increase in strength of about 17 per cent., and an increase of hardness (by the ball test) of about 10 per cent., while at the same time the metal may be worked better, that is to say, it can be bored, drilled, planed, filed, ground or otherwise worked without the difficulties which are experienced in performing such operations on commercial aluminum or those aluminum alloys which resemble aluminum.

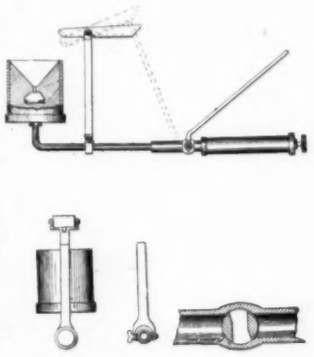
The amount of metal which can be added to the alloy is limited to a certain extent by the contents of the copper or

magnesium in the alloy. To an alloy containing 5 per cent. copper, manganese can be added from about 0.1 per cent. to at the highest about 1 per cent. With a lower copper content in the alloy, for example, about 2 per cent. copper, manganese can be added up to 3 per cent. without making the alloy too brittle.

1,130,974. March 9, 1915. **Casting Apparatus.** F. C. Hinman, Lincoln, Nebraska.

This invention relates to casting apparatus especially designed for use in dental work.

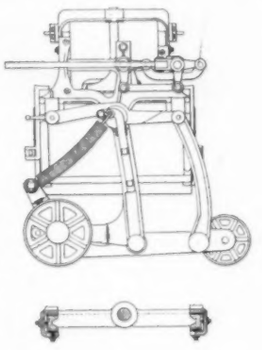
The principal object of the invention is to provide means, as shown in cut, whereby the metal may be melted at a point remote from the investment, the metal being subsequently dumped onto the investment so that the metal will be almost entirely deposited in the mold by gravity and but slight suction will be necessary in order to complete the filling of the investment.



A further object is to provide means whereby a metal can be heated to a boiling point and promptly dumped without removing the blow pipe therefrom, thus avoiding any slight delay of heat which would tend to chill the metal and produce an imperfect casting.

1,132,723. March 23, 1915. **Mold-Making Machine.** Charles F. Knowlton and Frank F. Elliott, of Pittsburgh, Pa., assignors to the Osborn Manufacturing Company, of Cleveland, Ohio, a corporation of Ohio.

The present improved mold-making machine, shown in cut, may be regarded as a modification of the so-called roll-over type of machine which is characterized by having the frame, that carries the pattern plate, oscillatorily supported about a substantially central axis, in place of an axis to one side as in the familiar rock-over type of construction. The modification in question relates to the construction of the supports for said pattern plate, which are so arranged that they may be tilted from a normal vertical position to a substantially horizontal position and thus lower the mold, or flask containing the same, which is attached, of course, during the molding operation to the pattern plate carrier, down onto the floor, or such other support, independent of the machine, as it may be desired to utilize for the reception of the completed mold.

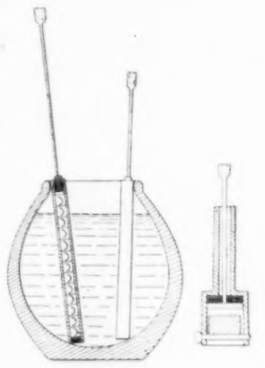


1,132,204. March 23, 1915. **Lubricant and Process of Making.** A. Warrell, Worcester, Mass., assignor to Continental Asbestos Corporation of the same place.

This invention relates to lubricants and processes of making same, and it comprises as a new composition of matter a putty-like or magma-like lubricant consisting of lubricating oil and a talc or soapstone material, advantageously of asbesti-form character, such as chrysotile asbestos, or "soapstone asbestos," ground or worked with such oil until a change takes place in its physical character, whereby the oil and mineral no longer separate on standing, that is, until the magma becomes permanent in character; and it also comprises a method of making such a lubricant wherein such a mineral and a suitable lubricating oil are worked or agitated together for a long period of time, and advantageously with the aid of a rotary beater, until the two become thoroughly incorporated with each other and a sample on removal no longer shows separation on standing.

1,132,376. March 6, 1915. **Apparatus for the Manufacture of Metallic Alloys.** W. N. Naylor, of Forest Hill, and S. R. Hutton, of Bechen Lane, England.

This invention relates to apparatus for the manufacture of metallic alloys, such for example as that described in our application for United States Patent Serial No. 732,972 of November 22, 1912, of which this application is a division.

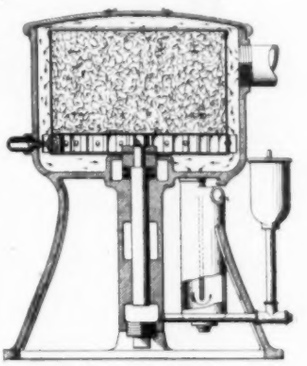


The accompanying drawing shows the apparatus together with a crucible.

In using this a quantity of aluminum is melted in a crucible and to this is added at a temperature of about 600 degrees C. or thereabout a percentage of magnesium and phosphor tin. The magnesium and phosphorated tin are incorporated with the aluminum by means of a special device in the form of a tube or casing through which the magnesium is made to enter the molten aluminum at the bottom of the crucible, this method being adopted owing to the low melting point and specific gravity of the magnesium.

1,132,965. March 23, 1915. **Centrifugal Machine.** W. L. D'Olin, Philadelphia, Pa.

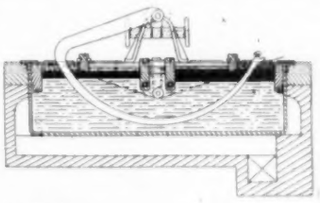
This invention relates to centrifugal machines for the extraction of liquids from solids, fabrics or fibrous material, and for similar uses.



This invention resides in apparatus of the character above referred to in which the centrifugal drum or basket is rotated by a steam turbine or impulse wheel, as shown in cut, so associated with the basket that the steam or motive fluid after impact upon the motor blades or buckets passes directly into the basket. And it is a further feature of the invention that, particularly for machines of small size, the motor blades or buckets are formed in parts formed on or struck out from the basket with complementary parts formed on or struck out from the bottom member of the bowl or basket.

1,132,889. March 23, 1915. **Galvanizing Bath.** N. K. Turnbull, Manchester, England.

This invention relates to the galvanizing of metal products such, for example, as wire or sheets, by immersion in molten zinc, and provides an improved construction or arrangement having for its object the prevention of the formation of "hard spelter" from the iron sides of the bath. The improvements also enable economy in the quantity of zinc employed as well as protection of such zinc from undue oxidation at the surfaces.



The present invention embodies several important details differing substantially from known efforts, whereby the zinc may cover the whole surface of the bath and yet receive no heat other than from the supporting metal such as lead.

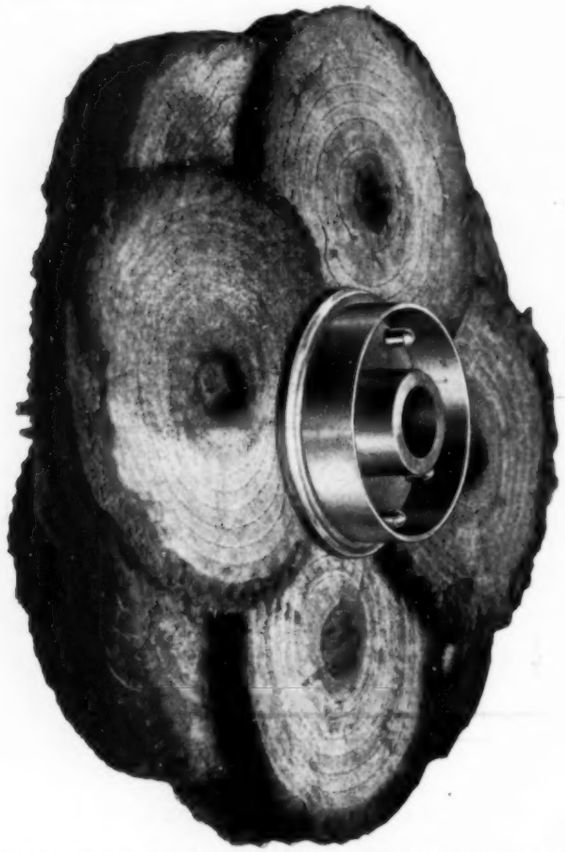
By this invention, means, as shown in cut, are adopted to prevent contact between the molten zinc and the iron sides of the bath, which stops the formation of "hard spelter."

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

THE NIKOLAS HUB

The cuts show the Nikolas hub that is now being used for utilizing the worn down sewed buffs which are ordinarily burned or disposed of for very little return on the original cost, so it will be seen that by the very application of this hub that it can be made a great money saver.



A POLISHING WHEEL MADE UP OF TWENTY-FOUR SECTIONS OF USED SEWED BUFFS.

BASE OF HUB.

Fig. 1 shows the hub loaded with twenty-four sections ready to be trued down to a smooth face. It is said by G. J. Nikolas & Co., of Chicago, Ill., who manufacture it, that it is no experiment but was in practical use for nearly a year before it was offered to the public. It is said that if a polishing department has enough worn sections to keep the hub in use that it will save at least $75 a year above the cost of the hub, which is $15.

RETAINING CAP.

PUNCH AND GAUGE FOR PERFORATING BUFFS.

The manufacturers claim that a wheel made up on this hub never cakes with the composition and does not require "opening up" as wheels do when made up with new sections. It is also stated that the wheel cuts more rapidly than a new one and the sections do not catch the work where they overlap.

Further information of this hub may be had by corresponding with G. J. Nikolas & Co.

THE CLEANING OF METAL WORK

By Expert.

The cleaning of metal work is materially simplified when materials are used for the blanking, stamping, drawing, spinning, machining, etc., of metal work, that are soluble in water. Oils, particularly the mineral oils, are usually difficult, as well as expensive, to remove, when metal manufacturers desire to clean the work before plating, lacquering, japanning, etc. The cost is reduced and the cleaning operation materially simplified by using compounds for lubricating, that are soluble in water, and which therefore can be very readily cleaned off.

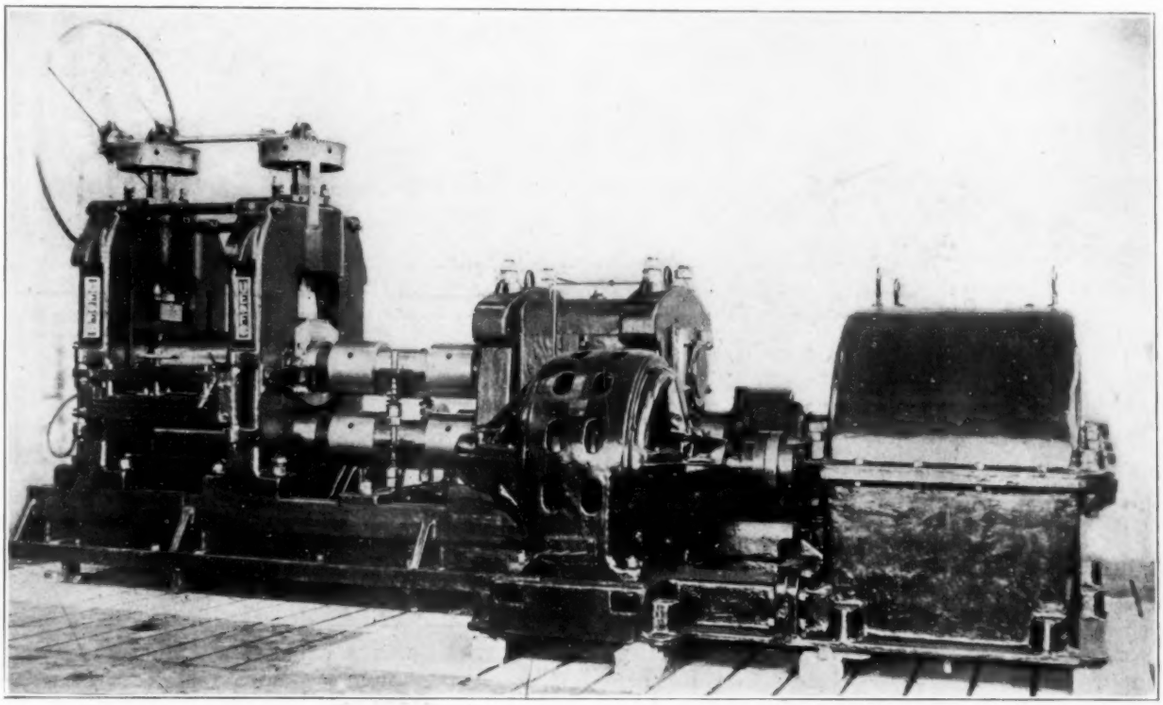
The International Chemical Company of Camden, N. J., have made a specialty of this line of materials for a number of years, and while it originally seemed impossible to get a compound of this kind to give satisfactory results for certain kinds of work, they have now developed lubricating compounds that are soluble in water and that will be found suited to the most difficult drawing operations on steel, iron, brass, copper, aluminum, etc. Their expert would be glad to make recommendations as to the proper method and materials to use, and will be glad to answer all inquiries, providing details are given as to the character of the work handled.

COLD ROLLING MILL

The United Engineering & Foundry Company, Pittsburgh, Pa., recently designed and built two cold mills to perform the work of equipment heretofore furnished to a large extent by European builders. The mills were exhibited February 24 at the Lloyd Booth department of the United company at Youngstown, Ohio.

The construction of these mills, one 12-inch and the other 20-inch was undertaken to furnish domestic buyers cold mill equipment similar to that obtained from Germany before the outbreak of the hostilities that have almost entirely isolated that country. Opinions expressed by engineers at the exhibit indicate that the United Company has developed mill types fully equal to those built by German concerns, so far as finish is concerned, and the design of the United mills, inspectors declared, is superior to that of the Germans. The mills were specially designed to meet the requirements of the cold rolling industry, and were finished in an unusually high degree, appearing more like machine tools than rolling mills. The accompanying illustration shows the general construction of the 20-inch mill, which embodies a number of special features.

The 20-inch mill was specially designed for rolling aluminum in widths up to 30 inches. The builders called particular attention to the driving unit, which consists of a tight housing in which gears of the double helical type operate in an oil bath. The drive is connected to the mill pinions through an Oldham coupling; the pinions also are enclosed and are provided with flood lubrication. The coupling boxes and spindles are completely machined so as to minimize back lash, and the screw down is so arranged that an accurate roll alignment can be maintained at all times. Index heads are provided on the screws so that the roller can adjust his rolls to 0.001 inch.



THE 20-INCH COLD ROLLING MILL DESIGNED FOR ROLLING ALUMINUM BY UNITED ENGINEERING AND FOUNDRY COMPANY, PITTSBURGH, PA.

WIZARD ALUMINUM SOLDER

The Wilkes-Barre Welding Company, J. Linn Johnson, proprietor, Wilkes-Barre, Pa., announce that they are now ready to furnish the Wizard aluminum solder which they guarantee to solder aluminum satisfactorily. It is claimed to be the only solder that runs at a very low temperature and when cold is not only harder than aluminum but also twice as strong.

The simplicity of soldering with Wizard aluminum solder is claimed as another point in its favor. All that is needed is a gasoline torch and the article to be soldered is heated and slightly rubbed with a smooth tool, such as a sharp end of a file, and when the solder is applied it will combine without a flux. It is expressly stated that the solder does not turn black and fall away from the work. Complete instructions for its use are sent with every stick. Further information may be obtained by writing to the Wilkes-Barre Welding Company, 6 West Ross street, Wilkes-Barre, Pa.

MOTOR DRIVEN TUMBLING BARREL

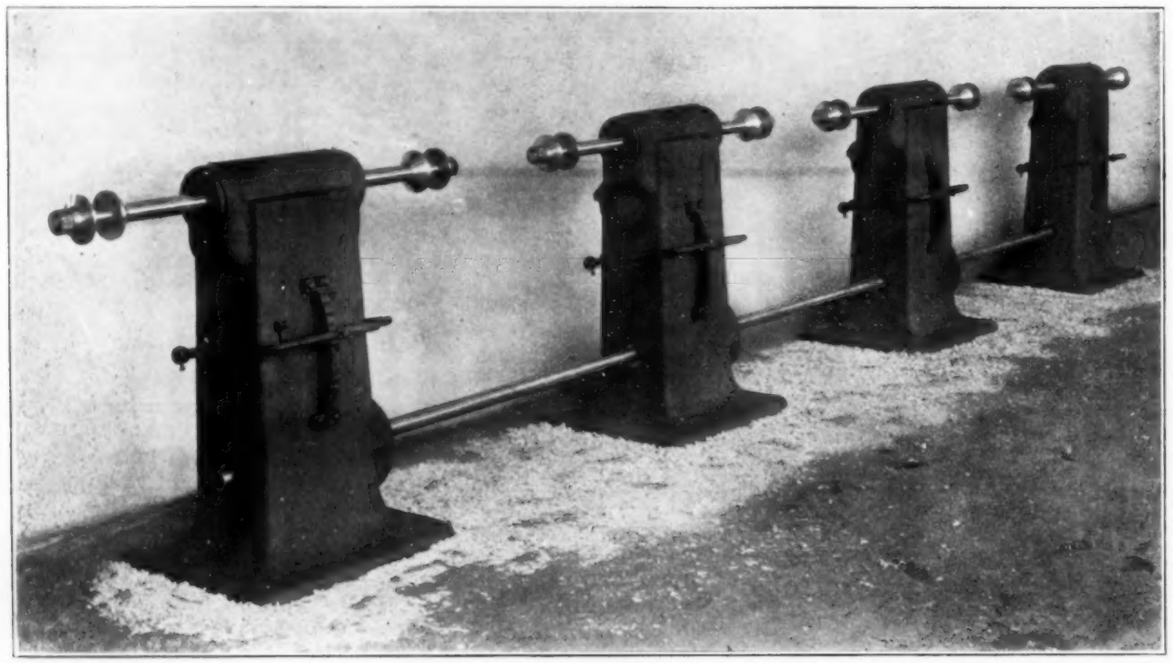
The Globe Machine & Stamping Company, Cleveland, O., announce that the latest thing in tumbling barrels is the No. 20, fitted with an individual motor, which is shown in the cut.

This barrel was designed and built by the company for the United States Government, a fact which alone justifies to the excellence and economical efficiency of the machine. The manufacturers state that any Globe tumbling barrel can be fitted with an electric motor suitable for use with any current and that they make tumbling barrels for almost any purpose, cleaning, smoothing, brightening or polishing, and description and illustrations of all of these machines are contained in their Catalog I, which is also filled with helpful hints on tumbling and polishing methods. Copies will be sent upon request.

A MOTOR-DRIVEN TUMBLING BARREL.

UNDERBELT DRIVEN POLISHING LATHES

The illustration shows four underbelt-driven ball-bearing polishing lathes, built by the Gardner Machine Company, Beloit, Wis. This arrangement is an adaptation of their regular underbelt type machines and is frequently used when there is not sufficient head room beneath the floor to permit the use of countershafts. Any number of machines can be connected to the line shaft which passes through the base near the floor and runs in ball bearings. This shaft carries a driving pulley within each base and is connected to the spindle pulley by means of a slack belt. By pushing down on the lever at front an idler pulley, mounted in ball bearings, is forced against the belt, thereby removing all slack. To stop the spindle it is simply required to raise the lever. A metal cover is placed on top of the machine completely enclosing the spindle pulley and belt. It is the general practice to cover the line shaft on this type of installation.



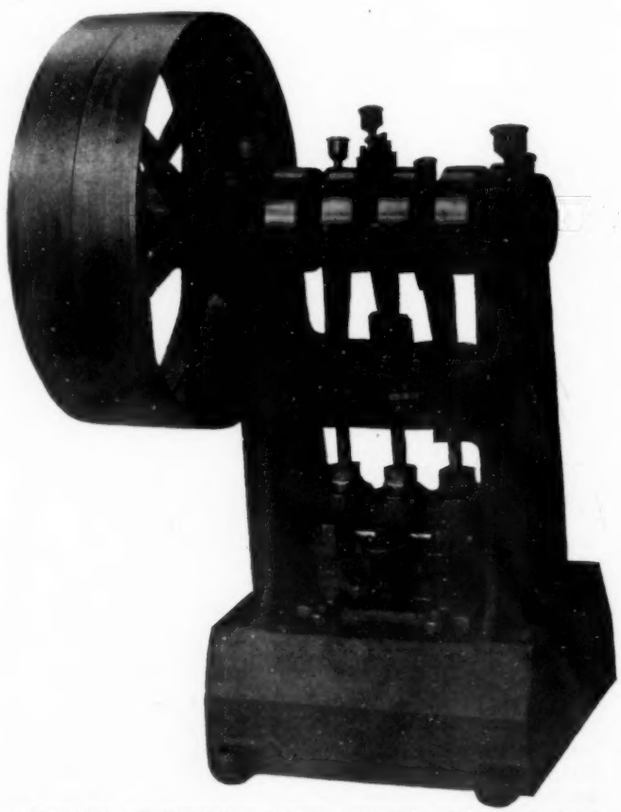
UNDERBELT-DRIVEN BALL-BEARING POLISHING LATHES, MANUFACTURED BY THE GARDNER MACHINE COMPANY, BELOIT, WIS.

SMALL HYDRAULIC PUMP

To meet the demand for a small inexpensive, but high grade hydraulic pump delivering a small quantity of water and still capable of exerting a high pressure upon the press ram, the pump illustrated was designed and built. This pump peculiarly fits the requirements where there is need for a steady, uniform flow of a small quantity of water under high pressure. On account of its light weight this pump, when motor driven, also may be mounted on a truck and be used as a portable pump for operating small hydraulic shop tools on which there is no pump mounted. It is provided with a knockout attachment which automatically cuts off the delivery of water to the press ram, but holds the pressure thereon, when the pre-determined maximum pressure is reached. A slight drop in the pressure automatically starts the flow which continues until the maximum pressure is again reached. The base of the pump forms a reservoir for the liquid used in the operation. The pump is built for either gear, chain or belt drive.

This pump is well constructed. The frame is cast in one piece of semi-steel. The crank shaft is machined from a solid bar of steel. The cross heads are of cold rolled steel. The connecting rods are made of malleable iron with bronze bearings. The pump plungers are naval bronze on all diameters, except on the 5/16 inch and ⅜ inch sizes where steel is used to withstand the high pressure. The pump cylinders are cast enbloc. With the 5/16 inch and ⅜ in. plunger the cylinder is made of forged steel. For the pumps having plunger diameters larger than ⅜ inch a special bronze is used for the cylinders. The pump has a height over all of 35 inches, and occupies a floor space of 16 inches by 18 inches. The weight of the pump itself without motor base or belt shifter is only 500 pounds.

This pump is another new hydraulic pump design added to the



TRIPLEX BELT-DRIVEN PUMP, MANUFACTURED BY THE HYDRAULIC PRESS MANUFACTURING COMPANY, MOUNT GILEAD, OHIO.

extensive line of hydraulic presses and pumps manufactured by The Hydraulic Press Manufacturing Company, Mount Gilead, Ohio.

QUICK ACTION PAASCHE BRUSH

The Paasche Air Brush Company, of Chicago, Ill., have sent out an elaborate catalogue in which they describe at some length their line of Model S three in one quick action air brushes.

The manufacturers claim for these brushes that they are so simple, durable and practical that they will withstand the hardest and roughest usage and they state that there are no weak, delicate parts or mechanism to clog or get out of order, which, it is said, has heretofore been the main drawback with air brushes, thus preventing their general adoption in the commercial world. The color adjusting parts are interchangeable and are made in four different sizes. A list of these parts is as follows:

Color adjusting parts No. 1, "Small Size, are for light and small work where water colors, dyes and material of light consistency are used.

Color adjusting parts No. 2, "Medium Size," are best adapted for all-around purposes where oil colors, shellacs, bronzes and pigments of medium consistency are used. This size parts are generally furnished with the brush.

Color adjusting parts No. 3, "Large Size," are for heavy and large work where oil colors, varnishes, enamels and materials of heavy consistency are used.

Color adjusting parts No. 4, "Extra Large Size," are best adapted for rapid covering of large surfaces requiring painting enameling, varnishing and finishing. With these parts it is necessary to also have a No. 4 air cap and guide, and the price of this complete attachment No. 4 is $4.00.

Some of the exclusive and patented features of the Paasche air brush are as follows:

Changing from one color or material to another quickly done. The flow of the liquid is entirely independent of the air circulation. This prevents clogging of materials, leaking and spilling, and does away with time wasted in taking the brush apart for cleaning, which is necessary with inferior and cruder makes.

The agitator keeps the material well stirred at all times, and must be used with all liquids that have a tendency to settle, such as bronzes, enamels, paints, etc. The coupling or taper step of the flexible metal tube or bottles are quickly detachable and one material after the other can be used without stopping or wasting time cleaning the entire apparatus. For smaller work where the colors are used in small quantities, the gravity feed metal cup or the underslung quick detachable color bottles will be found the most practical, and by using a few extra of these no time is wasted for cleaning. Leaking as well as spilling is also entirely done away with. No agitator is necessary with the bottle; the constant motion of the brush keeps material well stirred.

"ISCO'S" LATEST SPRAYERS

Marked improvements in sprayers are claimed in the new type produced by the International Spray Company of 208 Centre street, New York.

A notable feature that clearly distinguishes this company's sprayer is said to be the air-pressure reducing valve which was originated by them. By means of this reducer on the sprayer, the air as well as the fluid may be easily and perfectly regulated. This point is of high economic value to all finishers as it is a great saver of time and labor.

Another important advantage claimed is in the sensitive but easy, accurate control of the trigger by the operator. This is due to adjusted springs of the finest tension. The hose connection has the latest device both for convenience and efficiency; once attached it grips unusually firm and secure and requires no wire to tighten.

The International Spray Company announce that they are about to place an art brush on the market that has additional features over any that has been offered. This art sprayer will be found superior for retouching and for artists' use where high decorative skill is required.

It will be to the advantage of those in the market for sprayers or spray and exhaust systems to write for the illustrated catalogues of this company. A full line of sprayers, air compressors, air receivers, exhaust systems and spraying outfits are described and illustrated.

SMALL FANS

A new and rather interesting line of small exhaust fans and blowers has just been brought out by the Clarage Fan Company, of Kalamazoo, Mich. The general features of these fans are familiar in almost every plant, as it is seldom that a plant of any kind is operated without the aid of at least one or two small cast iron fans. This particular line, however, is built so that they are adjustable as to hand and discharge, which is said to be unusual in a cast iron fan and, moreover, they are designed so that they may be used either as single exhaust fans

THE CLARAGE FAN.

or as double inlet blowers. The double inlet fan is more efficient, and when used as blowers these fans save nearly ten per cent. in power over the single inlet type. The Clarage company pride themselves on the type of bearings furnished on all fans which they build, and no exception has been made of the small units. The two sets of sleeves are enclosed in a long case, which is made dustproof by felt washers which fit closely around the shaft at either end of this case. A collar placed between the sleeves acts as an oil ring, and furnishes a liberal supply of oil at all speeds. As this collar fits right around the shaft, and as the upper and lower parts of the sleeves and case are made alike, the fans may be inverted to fasten to the ceiling without change.

MAGNESIUM MADE ELECTROLYTICALLY

Metallic magnesium is to be manufactured electrolytically by the Aviation Materials Corporation, 99 Cedar street, New York, which has been incorporated under the laws of New York State. The plant will be located at Niagara Falls, N. Y., and it is expected it will be completed in June. It will operate under the patents of George O. Seward and F. von Kügelgen, who developed the process at the Virginia plant of the Virginia Electrolytic Company, Holcombs Rock, Va. The output is expected to be 10 tons of metallic magnesium per month. Besides being a constituent of some important alloys, magnesium is a beneficial addition to aluminum castings, as much as two per cent. often being used. An alloy containing 98 per cent. magnesium has been made by the inventors mentioned, which is lighter than aluminum and stronger. The average market price of metallic magnesium is $1.50 per pound.

ENGINEERING ALLOYS

National Alloys, Ltd. (Altior Foundry, Ilford, London), are now producing a series of high class engineering alloys.

"Cupranium" brass, a superior product to ordinary brass, has a guaranteed minimum tensile strength of 33 tons per square inch. It is not affected by sea water, mine water, or other corrosives, is of a rich golden color, entirely replacing brass for high-class work, and has further advantages in that it does not pit, and is not affected by arc lamp fumes. "Cupranium" tantalum bronze is an ideal bronze for high-class work and is especially recommended for turbine blades, working parts of pumps used in mining, etc. "Ivanium" light engineering alloy is one of the strongest light alloys made, and though only 2½ per cent. heavier than pure aluminum, is three times stronger.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE METAL INDUSTRY ORGANIZATIONS.

AMERICAN FOUNDRYMEN'S ASSOCIATION

Secretary Backert has sent out a notice to the members that the annual meeting of the association will take place at Atlantic City, N. J., during the week of September 27, with headquarters at the Hotel Marlborough-Blenheim. Business and technical sessions will be conducted on Young's steel pier, a photograph of which was shown in the January issue of THE METAL INDUSTRY. The exhibit of foundry equipment and supplies by the Foundry and Machine Exhibition Company will be held on the steel pier, and will open Saturday, September 25. A tentative program of the meeting already has been adopted, as follows:

Monday, September 27.

Registration. (Headquarters Young's steel pier.)

Tuesday, September 28.

10:00 a. m. Opening session, joint meeting between the American Foundrymen's Association and the American Institute of Metals.

2:00 p. m. Operating session.

Wednesday, September 29.

10:00 a. m. Cost congress, joint session between the American Foundrymen's Association and the American Institute of Metals.

2:00 p. m. Gray iron session.

8:00 p. m. Business session, annual address by president, election of officers, etc.

Thursday, September 30.

10:00 a. m. Simultaneous sessions on steel and malleable iron.

2:00 p. m. Simultaneous sessions on steel and malleable iron.

7:00 p. m. Annual banquet.

Friday, October 1.

10:00 a. m. Final business session.

The American Institute of Metals will hold their annual meeting at the same time and place, but other details of their program are not obtainable at the time of going to press.

AMERICAN ELECTRO-PLATERS' SOCIETY

(AN EDUCATIONAL SOCIETY.)

President, J. H. Hansjosten, Kokomo, Ind.; Secretary, Walter Fraine, 507 Grand Ave., Dayton, Ohio. All Correspondence should be addressed to the Secretary. The objects of this society are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. The Society meets in convention in the spring of each year, subject to the decision of the executive committee. The next convention will be held at Dayton, Ohio. The branch associations hold monthly and semi-monthly meetings in their various cities.

New York Branch held its regular monthly meeting on March 26, 1915, at its rooms in 262 Pearl street. After the regular business was finished, Mr. Reama and Mr. Dabolt, of the laboratory committee, gave an interesting demonstration on the testing of a silver solution for the content of free cyanide. At the next regular meeting there will be a demonstration on the determination of the metal content in a solution. The branch expects to hold an open meeting in the near future.

Newark Branch.—An open meeting of this branch was held at their rooms, March 19, 1915, with 90 members and guests present. President Horace H. Smith introduced Professor J. W. Richards, of Lehigh University, South Bethlehem, who addressed the meeting on the "A. B. C." of Electro-chemistry. Dr. Richards told the platers that they first should learn the A. B. C. of chemistry, then the A. B. C. of electricity, then electro-chemistry and finally electro-plating, for electro-plating is a branch of electro-chemistry. He then reviewed the work of Faraday and other pioneers in the science showing how hard it was to determine the quality and quantity of metals deposited before electrical measuring instruments were obtainable—and it was Faraday who gave us the idea—first the tangent galvanometer. Now we have the ampere-meter and volt-meter with which we can measure accurately just what work is being done. The professor continued his address for one hour using the blackboard to illustrate the development in the science of electro-chemistry. The next speaker was W. R. King, who gave a demonstration of bright nickel deposit on brass. He stated that by the process shown, the work would come out bright whether left in the bath for 19 minutes or 48 hours. He also said that double the number of amperes of current per square foot of surface was used as in the regular solution, hence the solution deposited twice as fast. The laboratory was inspected by the visitors after the meeting, and the members were reminded that they could use the laboratory at any time for research work. The first April meeting of the Newark branch was held on the evening of April 3, in charge of the Librarian Committee. A demonstration of a rapid copper plating solution was given by L. H. O'Donnell, and the rest of the evening was devoted to informal discussion of various plating problems and methods. A set of house rules was drafted by the House Committee for the regulation of the society's rooms was presented and adopted.

Foreman electroplaters should avail themselves of the advantages offered by the society, join the ranks, use the laboratory and endeavor to increase their knowledge of the important art of the electro-deposition of metals.

Dayton Branch. This branch has sent out invitations to their second annual banquet which will be held at the Algonquin Hotel, Dayton, Ohio, Saturday evening, April 10, 1915. Several speakers have been secured to address the platers and their friends and the plans for the second annual convention, which will be held at the National Cash Register Company's factory the first week in June, 1915, will be discussed. The banquet committee consists of C. F. Kettering, W. Fraine, C. A. Freund, F. Hartzel, A. Lamoureux and J. A. Keyes.

Toronto Branch.—The March meeting of this branch was held on the 25th, and provided another very interesting evening, a good turn-out of the members and some lively discussion on plating subjects in general being thoroughly enjoyed by all. On April 22 this branch will keep open house, and any person interested in any way in the electro-deposition of metals will be welcomed at the meeting room in the Occident Hall, corner Queen and Bathurst streets, at 8 p. m.

A very interesting program is being compiled, and an enjoyable and profitable evening is anticipated. One of the items will be the action of an acid copper solution illustrated by means of a projecting lantern, through a glass tank, and the actual action will be shown on the screen. This operation alone will be worth while seeing and hearing.

PERSONALS

ITEMS OF INTEREST TO THE INDIVIDUAL.

FIFTY-NINE YEARS A BRASS WORKER

THE METAL INDUSTRY has had the pleasure of publishing the photographs and careers of several captains of industry of the brass business who have rendered fifty years of active business services to that industry. Three of these captains were Chauncy P. Goss, president of the Scovill Manufacturing Company; Charles F. Brooker, president of the American Brass Company, and Thomas C. Locker, manager of the Charles Clifford & Son, Ltd., Birmingham, England.

Each of these gentlemen had been associated with the brass business for fifty years, and in our March issue we mentioned the sixty years' service of W. H. Hart with the Stanley Works, New Britain, Conn.

We herewith have the pleasure of presenting a brass worker who, although not a captain of industry, has for fifty-nine years actually worked brass. We refer to Charles Mellish, the picture of whose small chandelier and fixture shop at 870 Fulton street, Brooklyn, N. Y., is shown in cut. Mr. Mellish is standing in the doorway with one of his fourteen children by his side.

BRASS SHOP RUN BY A MAN 75 YEARS YOUNG.

Our "Brass Fifty-Niner" was born in Brooklyn 75 years ago, and at the age of sixteen went to work for the New York and Brooklyn Brass Company, manufacturers of brass kettles. Later he was employed by the Dietz Company, makers of ships lamps, candlesticks, etc., and then with Archer and Pan Coste Company, chandelier makers, becoming foreman of that concern in the lathe room department. In 1866 Mr. Mellish ventured into business for himself, making gas light fixtures and brass work for soda water fountains, also refinishing fixtures and brass work

During the past twenty years he has invented and obtained patents on several new devices, relating not only to fixture work, but even to a folding life-boat, for which he expects to receive letters of patent.

Mr. Mellish naturally can give some interesting shop experience, and in looking backward over his fifty-nine years he mentions what pride the trade took in the early days in turning out fine chandeliers and fixtures. There was no skimping in materials and the finish was of the very best. He remembers when the cheapest two-light gas fixture sold for $4.50, while now they are bought for $1.98. But Mr. Mellish thinks that they are a $1.98 dear, for they are so thin and have such a poor finish that they have no lasting value. Likewise the cheapest gas-light bracket in former days was $1 a piece, while they may sell today for thirty cents and look like it in the slang of the day.

In mentioning the different finishes Mr. Mellish states that the old-fashioned French bronze was introduced by a Frenchman fifty-nine years ago, and he was locked in a room of a factory and no one allowed near him. The process for this old-fashioned French bronze, which Mr. Mellish uses today in his work, he describes as follows:

THE PROCESS.

First, clean the work with potash; then size over with French varnish to give it a body and let it thoroughly dry. Next, a coat of copal varnish, and when sticky he takes a piece of chamois and the bronze powder and rubs over lightly. When this is dry another coat of French varnish is put on with a camel's hair brush, which gives the final touches and a beautiful finish, especially to small statues. Such a finish on a figure will last, with care, for a life-time. In applying this finish, of course, Mr. Mellish only uses the best materials and takes the time mentioned above, which he considers the only way to do to get good work, and that the modern rush methods of simply painting over with a brush turns out a very poor job and not at all artistic or durable.

An examination of some of the old-time brass work proved what Mr. Mellish said of how well and thoroughly it was done. All cast work and wrought work was of much heavier material than it is today, and with the fine finish of the old days the work had a much more lasting appearance.

Perhaps some of our modern brass workers and finishers would think the old-fashioned Mellish method too slow and cast and wrought work too heavy, a mere waste of material. However, so long as life is fleeting the brass art of the early days seems to stay with us, leaving a more pleasant and lasting impression than much of the quantity work that we are turning out in the modern factories. In the meantime Mr. Mellish at 75 years young continues to produce first class brass work.

WALTER C. ALLEN

Walter C. Allen is the new president of the Yale & Towne Manufacturing Company, Stamford, Conn. Mr. Allen has, as vice-president and general manager, been practically responsible for the management and direction, under the president, of the company's commercial affairs and general business. He will continue to act as general manager.

W. C. ALLEN.

Mr. Allen, who is 38 years old, was born in Farmington, Conn. As any other boy might have done, he entered the employ of his company 23 years ago as a truck-boy in the stock room. He served two years in the office and then devoted three years to learning the trade of tool-making. He next went into the drawing room, where he served three years. He was then selected as an assistant by the late Frederick T. Towne, general superintendent. He was next made assistant general superintendent and when Mr. Towne died he was made general superintendent in charge of the company's factory. In 1909 Mr. Allen came to New York as general manager in charge of selling and advertising, and in 1914 he was elected a vice-president of the company.

S. C. Hardy, formerly of the Renziehausen Company, of Newark, N. J., has become connected with the Supplee-Biddle Hardware Company, Philadelphia, Pa., in the rolling mill department.

W. R. Mample, superintendent of the foundries of the Aluminum Casting Company at Fairfield, Conn., has been transferred to the Detroit, Mich., plant of the same company.

Charles H. Matthews, formerly located at Chicago, Ill., has accepted a position as foreman plater of the Consolidated Engineering Company, Jacksonville, Florida.

Guy E. Marion, secretary and treasurer of the Special Libraries' Association, has severed his connection with Arthur D. Little, Inc., the well-known concern of chemists, engineers and managers of 93 Broad street, Boston, Mass., where he has been located for the past five years in charge of their information department. Mr. Marion will devote his entire attention to the business of the Libraries' Association.

DEATHS

FREDERICK W. TAYLOR

Frederick Winslow Taylor, the father of scientific management and inventor with the late Maunsel White of the Taylor-White high-speed metal-cutting steels, died unexpectedly on March 21 at the Medico-Chirurgical Hospital, Philadelphia, after a few days' illness with pneumonia. The day before his death was the fifty-ninth anniversary of his birth. He was born in Germantown, Pa., in 1856. His primary education was obtained in this country, in France and in Germany. He was prepared at Phillips Exeter Academy to enter Harvard.

F. W. TAYLOR.

His eye-sight failing, however, he was forced to withdraw and change his plans. He then apprenticed himself to a small pump works in Philadelphia, Pa., and from there entered the employ of the Midvale Steel Company as a laborer. Six years from the time he started with this company he was appointed chief engineer and in 1880 he began to study at night the engineering course as required by Stevens Institute of Technology and at the end of three years, in 1883, he obtained from Stevens the degree of mechanical engineer.

In 1898 Mr. Taylor became connected with the Bethlehem Steel Company, Bethlehem, Pa., where he introduced his scientific system of shop management both in machine shop and brass foundry, and in connection with this work he finally, in conjunction with the late Maunsel White, made the experiment which led to the discovery of the Taylor-White process of heat treatment of steels. In 1905 the University of Pennsylvania conferred the degree of doctor of science upon Mr. Taylor, and in 1912, Hobart College made him a doctor of laws. The Paris Exposition of 1900 presented him a gold medal for his participation in the Taylor-White process. It is said he received over 100 patents for inventions, included among which were some covering the equipment for the game of tennis, at which he was adept, having in 1881 captured the national championship in doubles.

E. W. Machette, the expert in rare minerals and metals, died in New York City on February 26. Mr. Machette was born in Philadelphia, Pa., about seventy years ago, and had spent the later years of his life in New York City. Mr. Machette was probably the best informed man on matters relating to rare metals and minerals, their occurrences, production and uses, in this country at least. His loss will be keenly felt in mineralogical and geological circles. He leaves his wife and two daughters, both married.

J. R. Andrews, president of the Hyde Windlass Company, of Bath, Me., died March 25, from a cerebral hemorrhage in his apartment at the Willbraham, No. 1 West Thirtieth street, New York City.

Mr. Andrews was born at Bridgewater, Mass., where he lived until he was sixteen, when he went to Bath, Me. There he began work in the machine shop of the Bathe Iron Works, of which he ultimately became president. Its name was changed to the Hyde Windlass Company, noted for its metal castings, such as manganese bronze, etc. He was a member of the Engineers', Lotos, Lawyers' and New York Yacht clubs. He leaves a wife and daughter, who live in Bath. He was fifty-three years of age.

As we go to press we learn of the deaths of two prominent brass men:

Frederick Dietz, president and treasurer of R. E. Dietz & Co., lantern and lamp manufacturers, 60 Laight Street, New York, died suddenly at his home in New York City, March 31. Mr. Dietz was sixty-seven years old and he is survived by a brother, J. E. Dietz, and a sister. He was a member of the New York Athletic Club.

Thomas L. Fowler died at his home in Richmond Hill, N. Y., March 31. Mr. Fowler was about sixty-three years old and began his business career in 1872 as a clerk with the Ansonia Brass and Copper Company, Ansonia, Conn. He afterwards became associated with the Aluminum Bronze Company, of Bridgeport, Conn., and for the past twenty years has been the New York selling agent of the Detroit Copper & Brass Rolling Mills, Detroit, Mich. He leaves a wife and one child.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS AND TRADE ITEMS OF INTEREST FROM THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

WATERBURY, CONN.

APRIL 5, 1915.

Not in nearly five years have the symptoms of business been more favorable here than they are today. In the larger manufacturing plants of the Naugatuck valley there is still considerable rush on war orders and this stands out in bold relief against the conditions of normal business which seem next to hopeless to the careless observer. It is known, however, that in the majority of metal manufacturing establishments throughout the entire Naugatuck valley the business done in March was larger than that done in February and that of February, short month as it is, was larger than the business in January. Moreover, the manufacturers know now that the country is buying. Orders are coming in slowly, but they are always coming in, so that just as one is filled there is another waiting. It is the healthiest kind of a revival for it is safe, sane and sound to the core.

"Apparently the orders now being received are most carefully made," said one manufacturer. "They indicate that the stock on hand is being bought, but the customers ordering now are confining all orders strictly to what they actually need and can afford to buy. This is a general condition in the metal market, except perhaps in some of the novelty lines and special lines like watches, jewelry, and the like. The outlook is decidedly a hopeful one, the best in a long time."

Ask manufacturers how they account for the improvement and they frankly confess that they cannot though they see it. "War orders have had the effect of stimulating the whole metal market and consequently practically all lines are benefited." That's the way one man attempted to explain it. In some of the plants where there have been no war orders the improvement has been steady and marked from the first of this year, as if verifying the old saying: "When the price of copper begins to rise, the brass business begins to hum."

There is one weakness in local conditions—the watch making industry. Thomaston's situation has been described in previous issues. There is practically no change. The Seth Thomas Clock Company has just begun the erection of the first unit of its new plant, a brick structure which will be as near fireproof as possible and model in every respect. Gradually the entire plant will be rebuilt along plans similar to those of the unit now under construction and the historic old frame buildings of the property will soon be removed. That is the best news there is about the watch business, at present.

The other side is that, while there were supposed to be some 23,000 watches of all grades on hand in the warerooms of the Seth Thomas Clock Company when its watch department slowed down a few months ago, there are some 750,000 watches in the stock rooms of the Waterbury Clock Company. Watches are not selling fast enough, now that the foreign market is closed and work is slack wherever they are made. During the past month 100 hands were laid off by the Waterbury Clock Company and there was much weeding out in all departments. That the skilled men might be retained, unskilled hands, many women and some of the younger men were sent home.

There is a suggestion in this arrangement that the manufacturers here are finding some difficulty holding their skilled machinists unless they have work which warrants employing them full time. Advertisements for skilled men are frequently appearing in the newspapers of Connecticut, Massachusetts and Rhode Island and the best wages in years are being offered by the machine shops and some of the manufacturers of firearms and ordnance.

In a statement to the newspapers of Waterbury, March 30, Charles H. Ingersoll, of Robert H. Ingersoll & Brother, announced that the new Ingersoll plant, formerly the property of the New England Watch Company, would be opened about May 1 and would begin the production of a new Ingersoll watch, different from any previous make and probably to be called the Ingersoll-Waterbury. Some of the Ingersoll men at Trenton are expected to come here and several of the former New England Watch Company men will begin work when the plant starts, returning from various points.

War business continues to keep some departments hereabouts working night and day, but the demand for unskilled labor is still light and many are seeking work. New Haven and Bridgeport firearms and ordnance makers have scores of former Waterbury men on their payrolls.

It is difficult to estimate the amount of manufacturing due to war business now, but conservative business men put it at between sixty and seventy-five per cent.—F. B. F.

BRIDGEPORT, CONN.

APRIL 5, 1915.

Bridgeport startled the commercial world during the month by the announcement that the Bridgeport Arms Company, with orders for 1,000,000 rifles for the Allies, was to commence business here as soon as its mammoth plant was partially completed. Since that time progress almost magic has been made in the erection of buildings for the company on the east shores of Pembroke Lake, over an extent of property about a mile in length and several hundred feet in width.

According to the backers of this concern, the capital for which is furnished by the Remington Arms-Union Metallic Cartridge Company, although the executive management is of different personnel, the Arms Company will employ 8,000 hands when it is in full operation. President Fred Enos of the Board of Trade, who was instrumental in bringing the plant here, is authority for the statement that the new concern will employ 2,000 men by July 1, when operations will be commenced. H. E. Wells, a prominent manufacturing man, is superintendent of the concern, which has its temporary offices in the building of the R. A.-U. M. C. Company at Boston and Seaview avenues. Since the coming of the concern to Bridgeport, it has been made known that the Chinese government has contracted with it for 5,000,000 rifles, for delivery as soon as possible.

Skilled workmen are pouring into the city to obtain positions in the various metal factories, which constitute about 80 per cent. of the industrial life of the city. The Bridgeport Arms Company is guaranteeing those hired two years at least of steady employment on the contract for the Allies. The Chinese contract will afford months more work. After the completion of these contracts, the company will enter into competition for the armament of the United States, provided the policy of preparedness is followed. The largest building of the plant has been completed as to exterior, and machinery is now being installed. This building is about 1,000 feet in length and 50 feet in width, one story high, of steel and brick construction. There are to be sixteen buildings when the construction work is completed.

With the larger of the metal factories working day and night and the smaller ones pushed to capacity during the day, it is safe to say that at least 60 per cent. of the contracts now being executed are war orders. After causing a temporary depression, the war has proven a big boon to stagnant industries, and augurs at present a period of prosperity for the city never before equaled.

The new buildings of the Bridgeport Brass Company and the R. A.-U. M. C. Company are now practically completed. The brass company's new structure is an imposing four-story concrete and steel factory building, modern in every detail and lighted by thousands of windows on all four sides.

The five new buildings of the R. A.-U. M. C. Company at Barnum avenue and Helen street, which, with two others across the street, cost $550,000 to erect, are now receiving their machinery. Those on the opposite side of the thoroughfare are nearing completion, with a force of 200 men working day and

night on their construction. Expenditure of $2,000,000 is a conservative estimate of the money put into new buildings by various local concerns since the war started.

While admitting that the contracts for the manufacture of shell parts for the R. A.-U. M. C. Company, which his company has always performed, had increased since last October, President Anker S. Lyhne, of the Bridgeport Metal Goods Company, denied that the company was planning to purchase the old Hotchkiss factory, near its own plant, for the purpose of expanding its business. Mr. Lyhne admitted that his factory was very busy.

The Locomobile Company of America, which recently furnished 750 trucks for the Allies, is now turning out an order for 160 pleasure cars for the Russian government, and has recently received an order for 400 trucks for the Russians. An order for 140 pleasure cars for Great Britain is also reported. The price paid for the motor trucks is $3,500. Sixty of the machines recently shipped to the Allies are now resting on the bottom of the English channel, having never reached their destination in France. The Locomobile factory is working day and night.—E. C. D.

NEW BRITAIN, CONN.

April 5, 1915.

Reviewing the business conditions of the metal industry in New Britain for the past month of March, the correspondent of The Metal Industry is able to state that conditions have improved materially in many branches. Some lines, however, do not show any appreciable gain, but at the worst there is no falling off noted. Edward B. Alling, of the firm of Neumann & Alling, prominent metal pattern makers who do an extensive business with all of the big factories in this city, states that he has noticed a welcome gain in business of late and, judging from the orders given him, the other concerns are picking up quite a little.

It may be said that fully fifty per cent. of the renewed activities in the manufacturing business here may be traced to orders for war materials. During the past month the most activity in local manufacturing lines has been shown by the North & Judd Manufacturing Company. This firm's business has increased 100 per cent. and is reported to be doing the largest business in its history. This prosperity burst is due to the war, for this firm manufactures buckles and harness strappings and has received many large orders for foreign governments.

The improved conditions are reflected in the dividends, and already this year the dividends have amounted to five per cent., one per cent. having been paid in January and two per cent. each in February and March. The Berlin Construction Company is also rushed with orders resulting from the war. The factory is working a day and night shift and an enormous order has just been received from the Remington Fire Arms Company, which is rushed with war orders. At a cost of approximately $10,000, an order for more than 500 tons of structural steel, delayed a month, has been shipped by the Berlin Construction Company to Sydney, Australia, via Vancouver, B. C. The expensive delay and inconvenience in getting this shipment off can be traced to the European war, which has tied up shippings in the larger American ports.

Day and night shifts are also being worked at the New Britain Machine Company, which never had as many orders ahead, and the Waterbury Tool Company, which has shown a new burst of speed. While the increased business at these concerns can be traced directly to the war, it must not be presumed that, except in the case of the North & Judd Manufacturing Company, the factories are putting out materials used directly in the strife. Their business is to provide machines and tools with which other concerns manufacture the articles used by the warring armies.

But where some concerns are rushed others are not showing evidence of much gain. The Stanley Rule & Level Company is not picking up very much and will not until after the war, as their largest trade is abroad. Landers, Frary & Clark's are picking up some now, but considerable trouble is found in getting certain raw materials from across the ocean. While the Stanley Works has the reputation of running on a fifty-five-hour schedule, there are many departments which are working but thirty-five hours. The American Hardware Corporation about holds its own, as does the Union Manufacturing Company.

Manager Prentice, of the G. Prentice Manufacturing Company, makers of buckles, etc., is expecting a most prosperous summer, however, and says: "I expect to do a fine business this season, and when I say fine I mean very, very good." The New Departure Manufacturing Company, makers of coaster brakes, bells, etc., is another shining light of prosperity just at this time. This month the stock carries its tenth dividend and the earnings are reported to be the heaviest in the history of the company. Business at the Bristol Brass Company is somewhat more quiet, but the general tendency is that business will not drop to any lower ebb, but on the contrary will gradually re-adjust itself.—H. R. J.

WORCESTER, MASS.

April 5, 1915.

Six large machine-tool concerns, employing in the aggregate 2,650 men, are running full time or overtime on war materials.

The largest of these firms, the Reed-Prentice Company, employing about 1,000 men, has been running its plant day and night for about four months, turning out mainly lathes and drills.

The Whitcomb-Blaisdell Company, employing about 350 hands, has been extremely busy for three months, and has been working some of its departments overtime on lathes and planers.

The Norton Grinding Company, which employs about 500 hands, is busy on an order for grinding machines, understood to be a large one. These machines are used in metal working trades. Their destination has not been announced.

The Heald Machine Company, employing about 250 hands, is also stated to be turning out grinding machines to be used indirectly in the production of war materials.

The Worcester Machine Screw Company, employing about 300 men, is running its plant full time. It is reported to have a large order for war materials, the character of which is not stated.

The Leland-Gifford Company, manufacturer of machine tools and allied lines, and employing about 250 men, is working some departments overtime. Its orders are said to include 150 profiling machines, used in making projectiles; sensitive drills and crank shafts for military automobiles.

The Worcester Pressed Steel Company has had work for some months on an order said to be for 100,000 metal scabboards. The Wright Wire Company, of which Mayor George M. Wright is president, is busy, it is said, on an order for 80,000 sets of wire tags for harnesses, worth $300,000.

Although as yet the indications of a general revival of business have not become visible to the man in the street, they are seen by the men who keep a finger most steadily on the industrial pulse of the city, the bankers.

If savings banks are accepted as indicators of a community's prosperity, Worcester has suffered no mortal hurt from business depression.

The total deposits of the Worcester savings banks last October were $69,367,153.31. The city's population, by the last census, was 166,025. Worcester therefore had in the savings banks last fall $417 for every man, woman and child in the city—and she has more now.

Her deposits actually increased during the winter and are now, in round figures, about $70,000,000.

BOSTON, MASS.

April 5, 1915.

Conditions have shown little change in the metal industry in Boston and vicinity during the past month. If anything, there has been a slight improvement in activity, especially in construction lines and interior finish.

Within the past fortnight one of the leading manufacturing jewelers has installed more modern machinery in the place of several units that were beginning to be out of date and thereby has gained sufficient bench space to enable him to put five additional men at work. This employer is A. S. Hirshberg, who foresees an increase of business to come as the sequence to the European war and says that he intends to be prepared to meet it.

Apparently none of the Boston coppersmiths are receiving any

special orders that are traceable to European sources. Most of the call for brass work in the city is attributed to the activity of the mayor in urging capitalists of Boston and the suburbs to do contemplated construction work at the present time in order to lessen the burden of unemployment that has been so acute here during the past four or five months.

The demolition of the building at 364 Washington street has caused the removal of several manufacturing jewelers. H. S. Lane & Son have new quarters at 119 Summer street. The White Plating Company removes to 352 Washington street. The F. W. Parris Silver Company takes room 309 at 36 Bromfield street. Adams & Singleton are also at 36 Bromfield street.—J. S. B.

BUFFALO, N. Y.

APRIL 5, 1915.

"I'm a neutral" is the policy of the local metal industries. The amount of business which is being done for the warring nations is very small. It would merely represent an insignificant skeleton. Local men are not looking for immediate profit; they are building for the future. The Buffalonians are not anxious about this sort of trade; they are looking for something more staple and lasting. They do not intend to make additions to their plants, increase their force of men for a temporary boom whose bottom is apt to drop out at any minute. In this particular, only, they are adopting the motto of the present administration, "Watchful waiting," but it's with boiling ladles of metal. And when they pour they expect to do some pouring.

Many of the local men are confident that the men who are able to survive through this business deadlock will make plenty of money in the end, but "It's a long way to Tipperary," they say. Nothing sudden or startling do they expect will take place within the next sixteen months. However, they do believe that business will improve somewhat before that time.

All local men say that they have never known a time in their business careers that money was so tight. One man puts it in this fashion: "Collections are rotten. Never saw anything like it before. Men who always paid within days upon receipt of goods now ask you to take their note for two or three months and then, when it falls due, they ask you to renew it."

The foundry trade conditions have improved some during the past month. More men are working and a broader smile is on the faces of local foundrymen. Some are busier than others.

The American Bronze Company claim that they are doubling their tonnage each week. The new vice-president, Charles Griffiths, is not from Westfield, N. J., but a Buffalonian.

William Stewart, manager of the Unique Brass Foundry Company, in speaking about trade conditions said: "We are quite busy these days. Orders seem to be coming in very nicely. Only today I received a 2,655 piece order. Don't know the exact tonnage, as I haven't as yet received the patterns. It's a mighty fine order, I can assure you of that much." He continued by saying: "The architects are finishing the specifications for our new foundry, which we expect to build before the summer is over."

Fred Schnell, president of the Schnell Bronze Bearing Company, Inc., repudiates any statement made that Harry Harriton, a local metal dealer, has bought an interest in his company by saying: "The stock of the Schnell Bronze Bearing Company, Inc., is controlled by the same people that it always has been and Harry Harriton does not hold any of its stock."

Local rolling and finishing mills and factories are kept fairly busy on puppet boomlet orders. Most of the orders are for brass. Copper goods are moving quite a bit slower.

George Ray Manufacturing Company report that their volume of business this year exceeds that of a year ago and despite of this their conditions are by no means normal.

The Buffalo Copper and Brass Rolling Mill report that they are moving along fairly well. One roll and their annealing plant is being run nights. They do not know how long this little boom will last. This firm is making a $5,000 one-story steel, brick addition to their casting department. The addition will be 70 x 32 x 10 feet.

Electroplaters and polishers are not as busy as they might be. Everywhere an expression of pessimism is heard concerning trade conditions. However, none have lost hope about the future. They all hold a "wishbone" in their hand, wishing all sorts of nice things about our political brothers.

One official of the A. F. Flanders Manufacturing Company said: "Business has improved very little during the past month. And to be really frank with you, I believe the conditions today are worse than they were in 1893."

"What we need in this country is a change in administration," said A. G. Fries, of the A. G. Fries Plating Company. "We ought to give that whole bunch in Washington an eternal vacation."

The Washington Plating Works have made a number of improvements during the past month in their plant and office. Many new features have been added to their shops; also, they now have a new, well-lighted private office equipped with mahogany furniture. "And before we get through," said Walter Hayes, "we are going to have a very fine establishment and offices. Nothing will be left undone to make our plant up to date in every particular."

Two new firms have filed certificates of incorporation during the past month. They are: The Rex Dental Company, Inc., capitalized at $5,000, to manufacture and deal in all kinds of dental surgical instruments, etc., Incorporators are: Joseph P. Panzica, Jacob R. Panzica and Frank A. Miceli, all of Buffalo. The other is: The Wrought Metal Products Company, Inc., capitalized at $15,000, to design, manufacture and sell metal goods of all kinds. Incorporators are: Milton F. Dumble, Harold R. H. Richards and John H. Germar, all of Buffalo.

The Acme Pattern Company have changed their name to that of the Acme Pattern and Machine Company, Inc.—G. W. G.

NIAGARA FALLS, N. Y.

APRIL 5, 1915.

Amid the thundering of falling waters and the business slump which is sweeping over this country, Niagara Falls metal industries are doing a fair amount of business. While conditions are not normal, yet all of them manage to be doing something to keep their wheels and furnaces in operation.

Every foundry has a blazing fire under its many furnaces. And every foundry man is optimistic, as they are all figuring on landing some mighty big orders before many moons.

At the present time the Frontier Brass Foundry Company is working on twelve 1,200-pound copper water-cooled contact-plate castings, also three 350-pound copper water-cooled separator castings for the Union Carbite Company's electric furnaces.

Niagara Falls is fast becoming the industrial electro-chemical research laboratory for the world. And another proof of this is the "Titanium aluminum bronze" as manufactured by the Titanium Alloy Manufacturing Company. This product is the result of three years' research work on the part of this firm, and as a result they are now making a specialty of this product; however, they do any other kind of work in brass or bronze castings. Nothing was left undone to bring their process to perfection, even the installation of electric furnaces. As a result they have been recognized by world-wide famous authorities. To meet the conditions which surround this new discovery as made by them, they have just moved into a new plant, which occupies several acres of land. All shop buildings are steel, brick structures, while the office and testing laboratories are frame buildings. Their new plant is equipped with two separate foundries, gas and electric furnaces in each; buffing and polishing shop; power and heating plant; private switch; up-to-date office building; complete chemical and physical laboratories; also a special alloy experimental room. Several chemists and physicists are kept constantly busy making analyses and experimenting to make their wares better. Every order is scientifically tested before it is shipped.

The Aluminum Company of America is doing considerable work on aluminum sheets to be used by automobile manufacturers.

All local electroplaters, finishers and manufacturers are fairly busy, but nothing very exciting. A. H. Wright, a jewelry manufacturer, describes business conditions thus: "Business is very poor in my line. Where I used to get $200 to $400 worth of business each month from most of my customers, I now only get $10 worth. It's hardly worth while to turn the wheels."

The Niagara Falls Stamping Company report that they are doing quite a bit of work for the French Army, making brass trimmings for harnesses. Other than that they say business is dead.

"Business is about normal with us," said one of the Car-

borundum Company's officials. "All of our factories are running, including those in England, France and Germany. What effect this blockade is going to have on us we cannot determine as yet." Aloxite and bauxite are two products of the Carborundum people. They claim that these new products will do better and more work than any of their other products. This addition to their family of wares is classed among the hardest known substances of the world.—G. W. G.

DETROIT, MICH.

April 5, 1915.

Conditions in the metal and other industries of this section have improved greatly since two months ago. The automobile and motor truck factories are running to their full capacity, and their increase in output is way ahead of the first three months of 1914. The war is still furnishing most of the business upsets and also much of the business now evident. Detroit has furnished large shipments of automobiles and motor trucks for European governments. Accurate and authentic figures are not available, because all concerned are maintaining absolute secrecy.

Motor car plants and other users of brass, copper and aluminum in Detroit are beginning to feel the affects of the war in Europe in a way entirely different from at first expected. Since the Allies have been placing orders for ammunition, especially copper tipped bullets and other projectiles, the price of the products named have gradually advanced and they have become more difficult to obtain. On January 1, 1915, brass was selling here for 12 cents a pound, or thereabouts. This price has gradually increased until at present it is bringing about 16 cents a pound.

Owing to the fact that Detroit uses great quantities of this metal in the manufacture of automobiles, this city as a manufacturing center of motor cars is being hard hit. Brass and copper are largely used in the manufacture of motor car radiators, because this metal does not corrode or rust when in contact with water. Motor car lamps also are largely made from brass, as are many of the parts that enter into the electric equipment.

It is currently reported in Detroit that the Michigan Copper and Brass Rolling Mills had made a contract several months ago to dispose of its year's product to the British Government at one and a half cents more a pound than it is bringing in the home market. When this report was brought to the attention of David M. Ireland, president of the company, he declared that no contracts had been made with any foreign government, and that it was not true that his company had contracted for its entire year's output. He did state, however, that a few orders had been received for sheet brass from certain individuals in Canada, but that none had been sold to the Canadian or the British governments. However, earlier in the year a large order was received from Europe by the Detroit Copper and Brass Rolling Mills and shipped abroad weeks ago. These are about the only orders thus far known to have been exported by this company.

It is believed that an extensive business is being done in Detroit by local brass firms in the manufacture of war material. Few will admit that this is true, and when questioned others will evade direct answer. Among those who are reported making shells from eight inch to musket size are the Detroit Screw Works and the Ireland & Mathews Manufacturing Company.

It is known that an agent of the French Government has been in Detroit within the past week trying to make contracts with certain firms here for the manufacture of shells of various sizes. It is learned that one shop is manufacturing 9,000 shells a day, and an effort was made by the agent named to have the production increased.

It is learned that an Italian maker of automobile bodies has recently ordered from the Detroit Heating & Lighting Company two large japaning ovens of the very latest type. These orders were obtained, says F. B. Joy, president of the company, only after the merits of these ovens had been investigated and tested in every way. They are fitted with proportional mixers and safety device, which automatically cuts off the gas if the air supply fails. The burner installation is so efficient that the temperature can be raised from 70 to 500 degs. F. in fifteen minutes.—F. J. H.

There is a large number of brass manufacturing concerns along the Canadian border now running to their full capacity in the manufacture of brass parts for shrapnel shells. These concerns were about at a standstill two months ago. Some of these concerns have booked large orders.

The manufacturers of plumbing and steam brass goods have increased their forces and are all running full time.

The McRae & Roberts Company, 227 Campbell avenue, report business good for this time of year. They manufacture a full line of plumbing and steam brass goods and specialties for the automobile trade.

The Detroit Sanitary Supply Company, corner Second and Antoinette streets, report business good and promising for this season.

The General Aluminum and Brass Manufacturing Company, Boulevard and St. Aubin street, have quite a large amount of work on hand at the present time.

Stockholders of the Trio Manufacturing Company have authorized an increase of capital stock from $250,000 to $300,000. Secretary-Treasurer J. H. Hamblin says that $25,000 of the increase will be issued as preferred stock at par just as soon as the certificates can be prepared. The full amount will be taken by the members of the concern. "The increase is made necessary by the growing business of the concern," says Mr. Hamblin. He reports that last year was the best in the history of the company, and that its officers are counting on doing even more in 1915. Estimates of this year's business have been placed at $50,000. The Trio Manufacturing Company manufacture auto parts and stampings, pump oil and gas tanks.

The Magnus Company, of Detroit, with an authorized capital of $100,000, has been organized to take over the brass casting and foundry business of the National Fulton Brass Manufacturing Company, 220 Brush street. The principal stockholders of the new company are A. J. Skiffington, president and general manager; Edward F. Lally, secretary; Alfred H. Roe, treasurer. All were former employees of the National Fulton Company.

The copper mines in Michigan are now running at 90 per cent. of their capacity and when this new additional supply comes from the smelters it will be interesting to note what effect it has on prices.—P. W. B.

MONTREAL, QUEBEC, CANADA

April 5, 1915.

The general trade of this district is very materially affected by the conditions which prevail at the present time all over this country, occasioned by the war. Merchants are afraid to stock goods and will buy only what they actually need at the moment. Collections are very bad, and the banks are holding money very tight and will only accommodate their regular customers. Many lines of business could be advanced if the banks were more liberal. The country districts are not in such a bad condition as the cities. The farmers are getting good prices for their products and are prepared to have their wants supplied. The traders in the city here report that business in country districts is about ordinary. The plating business has been extremely dull, especially the last few months. This is attributed to the general depression on account of the war. It is expected, however, that this line will improve as the season advances. The metal industries are mostly all affected in the same way.—C. T. C.

COLUMBUS, OHIO

April 5, 1915.

The metal market in Columbus and central Ohio has developed considerable firmness during the past month. The tone is better all along the line and future prospects are better. On the whole it looks like the European war will help the trade in many ways and that the extreme low prices which prevailed several months ago are a thing of the past. The supply of metals is not quite as large in this territory, which, coupled with a better demand, is having its effect on quotations.

A considerable percentage of the activities noted during the past few weeks can be attributed directly to the war. This is especially true in brass and copper. Other metals are also sharing the strength of those mentioned.

Zinc is a little quiet, but that is to be expected under the circumstances. Copper is stronger and scraps are selling from

14 to 14½ cents. Brass is also firmer and quotations are: Red scraps, 10¾ to 11½ cents; yellow scraps, 8¾ to 9 cents. Aluminum is fairly active at unchanged levels. Babbitt is firmer and prices are steady. Tin is selling at various prices and stability is not seen. Lead is selling around $4.15 per hundred.

The Republic Stamping & Enameling Company, of Canton, Ohio, has increased its capital stock from $1,250,000 to $2,500,000 for the purpose of taking over the General Stamping Company, which has been purchased outright and operated since March 1. A new white ware is being made exclusively in the new plant.

The K. & M. Brass and Aluminum Castings Company, of Cleveland, Ohio, has been incorporated with a capital stock of $10,000 to deal in metal castings of all kinds. The incorporators are: D. E. Morgan, John C. Barkley, L. S. Lommasson, B. Denner and John P. Dempsey.

The Wyen & Grieshop Sheet Metal Manufacturing Company, of New Bremen, Ohio, has been incorporated with a capital stock of $6,000 to do a general tinning business. The incorporators are: F. H. Wyen, William Grieshop, J. A. Barhorst and Clara Wyen.—J. N. C.

CINCINNATI, OHIO

April 5, 1915.

The demand for materials and machinery for the warring nations in Europe has reached such a point in Cincinnati that there are several industries, some of which are closely related to the metal trades, which owe virtually their entire activity at present to this line of work. Furthermore, it has been declared by no less an authority than Bernard Freudenstein, manager of the Foreign Trade Department of the Chamber of Commerce, that if other local manufacturers, especially in the tool trades, would make the changes in their plants necessary to enable them to turn out the goods which are wanted, the volume of such business handled locally would be much larger. The Bullock Electric Company, for one example, is now busily engaged in turning out shrapnel and other shells at its immense plant in Norwood, a Cincinnati suburb, and the American Tool Company, another leading manufacturer of machine tools, is working almost night and day, not only on the ammunition casings, but on the tools which are in urgent demand abroad for use in the manufacture of similar goods there. The recent statement, published in the press, of General Sir John French, to the effect that the war has narrowed down to a point where ammunition supplies are the deciding factor, indicates clearly the extent to which American manufacturers are profiting from the situation, and explains why the local industries which are in a position to handle the business are working at top speed.

Other business, in fact, has been so subordinated to this pressing demand, and, besides, is so extremely slow that it is declared war orders constitute virtually 100 per cent. of the business of some local concerns, which are making both machinery, such as lathes and drill-presses, and supplies; while a local foundryman, whose plant is kept extremely busy making metal castings for the machinery manufacturers, estimates the business for which the war is directly responsible at 60 per cent. of his output. fair average, therefore, would be in the neighborhood of 75 per cent. and possibly more.

On this score, therefore, the metal trades locally have no occasion to complain of the war. Taking the broader view that the tremendous waste of property for which the conflict is responsible cannot but harm the whole world, and that, in particular, it is now responsible to a large extent for the present business depression in this country, most of the local members of the trade are hoping for the close of the conflict, believing that not until then will business in other departments of trade recover a normal tone.

The Victor Lamp Company, of Cincinnati, is making preparations for the construction and equipment of a nickel-plating department, in connection with its present plant on Colerain avenue. Martin Fisher, architect, has the plans in charge.—K. C. C.

TRENTON, N. J.

April 5, 1915.

There has been a distinct and marked improvement in the metal industries in this section during the past month and manufacturers are very hopeful for continued prosperity for the coming summer months. While there appears to be no great rush of business with any of the local concerns the industrial improvement in the metal lines during the past month gives considerable encouragement. Orders for the fighting nations in Europe have little effect upon local industries, excepting iron and steel plants. Concerns here claim that they would rather run a little behind than be rushed with war orders. This is undoubtedly due to the belief that the recent $1,000,000 fire at the plant of the John A. Roebling's Sons Company was caused by some one not in sympathy with the concern manufacturing trace chains for the Allies. Previous to the fire an attempt was made to blow up the big plant.

Business at the Trenton Brass and Machine plant has shown an improvement of about fifty-five per cent. during March, according to William H. Schulte, the manager. "We believe that business is going to pick up from now on," said Mr. Schulte, "and expect a general improvement in the metal lines for the coming summer months. We are not working on any orders for any of the fighting nations and do not want any."

Philip Billingham, president of the Billingham Brass and Machine Foundry, was optimistic when seen by a representative for THE METAL INDUSTRY. "We are now working five days a week in all departments, and this is encouraging when we think of other concerns operating but half time. We expect business to pick up from now on and have faith in returning prosperity." The Billingham foundry has plenty of government work to be turned out in no particular time and the orders are filled slowly to keep the plant in full operation during the entire summer. An improvement in the pottery trade helps in the manufacture of brass goods for the many potteries in this city.

The Skillman Hardware Manufacturing Company continues busy and all departments are operating on full time. There has been a demand for brass goods and most of the orders for the same come from the Middle West. Business is booming at the Mercer Automobile plant here, and this accounts largely for the improvement along the brass and copper lines. There has been little change, if any, in the brass department of the Jordan L. Mott Company during the past month. Superintendent Lindmer believes there will be an improvement during April. The Trenton Smelting and Refining Company is having a large addition built to the plant. A few additional mechanics are being employed. Daniel J. Bechtel, of the Bechtel Engraving Company, says there has been no change for the better in the general line of metals. Because of the dull season in the rubber business little die work for these plants is being turned out. John W. Metz, president of the National Electric Plating Works, reports business livelier than last month. He, too, expects the trade to pick up during the coming months.—C. A. L.

NEWARK, N. J.

April 5, 1915.

Irving S. Cooke, formerly with the Elite Novelty Company, Austin and Murray streets, has gone in business for himself at 95 Oliver street, where he makes bronze patterns for soft metal cast goods of every description. He also does designing, modeling, mold-making and chasing.

Leon E. Olney, who conducted a metal plating, electro-plating and coloring business at 93 Lafayette street, has gone out of business.

A new firm known as Lange & Landry have started in the casting and mold-making business at Room 202, Richardson building Columbia, street. They will make a specialty of gold, silver and bronze casting.

J. E. Ferriday, lapper and polisher, at 50 Columbia street, is installing equipment that will enable him to do all kinds of electro-plating work. Gold and silver plating on metals will be a special feature of his new work, which will be conducted in connection with his old line. He also expects to do bronze plating in considerable quantity.

Prof. Joseph W. Richards, head of the department of metallurgy of Lehigh University, was the principal speaker at an open meeting of the Newark branch of the American Electro-Platers' Society, which was held on Friday evening, March 19, at the branch's headquarters, 49 Bank street. His subject was "The A B C of Electro-Chemistry." A paper was also read by Willis R. King, of the Hanson & Van Winkle Company.—R. B. M.

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The Yale Plating Company, formerly located at 15 Avon street, Boston, Mass., have moved to 125 Summer street.

The American Graphaphone Company, Railroad avenue, Bridgeport, Conn., plans to construct an additional story on each of its two factories. One is 60x110 ft., the other 60x145 ft.

The British Government has prohibited the exportation of tin to other than British ports. Efforts are being made to obtain special permits for shipments to consumers in the United States.

The Indiana Brass Company, Frankfort, Ind., whose plant was recently destroyed by fire, will occupy a two-story brick building, formerly used by the Great Western Smelting & Refining Company.

C. Upham Ely, manufacturer of nickel anodes, 60 Vesey Street, New York, has added the Crown Rheostat manufactured by the Crown Rheostat and Supply Company, Chicago, Ill., to his line of platers' supplies.

The Acme Die-Casting Corporation, Bush Terminal Building, No. 5, Thirty-fifth street and Third avenue, Brooklyn, N. Y., has leased about 6,200 square feet of floor space and will go into the manufacture of die-castings in white metal alloys.

The Board of Public Works of Pittsfield, Mass., on February 26 awarded the contract for such brass goods as will be used by the city for the coming year, corporation and curb cocks, to the Glauber Brass Manufacturing Company, Cleveland, Ohio.

Handy & Harman, dealers in bullion and specie, 59 Cedar street, New York, have let the contract for a new building at Bridgeport, Conn., for their silver rolling mills. As much of the present machinery at Bridgeport will be used as possible.

The New York Central Railroad was awarded the E. H. Harriman gold medal for having the best record in safety and accident prevention during the year 1914. The award was made by the Museum of Safety on evidence submitted by competing railroads to the committee of judges.

The Maydwell Company, Inc., with offices at 408 Globe Block, Seattle Wash.; 409-411 Sheldon Building, San Francisco, Cal., and 822 Central Building, Los Angeles, Cal., has been appointed Pacific Coast representatives for the Electrical Alloy Company, manufacturers of resistance materials, Morristown, N. J.

The Specialty Brass Company, Kenosha, Wis., manufacturers of sanitary creamery fittings, announce in their advertisement that they are looking for contract work in the line of brass, bronze, aluminum, and German silver castings, S. B. bearing bronze, polishing, buffing, nickel plating and metal patterns.

The American Rotary Valve Company, Anderson, Ind., has started work on a new foundry, which they expect to have completed about June 1. This foundry will replace the one recently destroyed by fire. Among the departments operated by this company besides the foundry are the brass machine shop, tool room and grinding room.

The Terry Steam Turbine Company, manufacturers of turbines for all purposes, Hartford, Conn., have appointed A. W. de Revere to take charge of their Chicago office, which is located in the Peoples Gas Building, Chicago, Ill. The company has also opened an office in the Michigan Trust Building, Grand Rapids Mich., in charge of A. L. Searles.

The Minneapolis Plating Company, Minneapolis, Minn., has installed a large assortment of brass working machinery, especially adapted to the manufacture of high-class builders' hardware. They are also manufacturing metal display fixtures of all types, and these lines added to their large plating plant will give them the facilities for handling everything from the blue print to the finished article.

The Liberty Machine and Manufacturing Company, 238 Dwight street, Springfield, Mass., has passed into the hands of new owners, James R. Connery being treasurer and manager. The company does a large business in all kinds of machine and brass work, and make special machinery, tools and metal patterns. The new owners plan to make several additions and alterations in the factory building.

Louis Maessner and Paul Van Ess, Grand Rapids, Mich., who for twenty-five years have been in the plating and polishing business, have affiliated and opened the Furniture City Plating Company at 280 Bridge street, N. W., Grand Rapids, Mich. The firm will do all kinds of plating, oxidizing and polishing, and Mr. Maessner will have charge of the plating department, while Mr. Van Ess will take care of the polishing department.

At a recent meeting in Buffalo, N. Y., of the Association of Edison Purchasing Agents, the following officers were elected for one year: W. H. Francis, president, P. A. Edison Electric Illuminating Company, Boston, Mass.; Andrew Banks, first vice-president, P. A. Consolidated Gas, Electric Light & Power Company, Baltimore, Md.; J. W. Brennan, second vice-president, P. A. Edison Illuminating Company, Detroit, Mich.; D. R. Blaicher, treasurer, P. A. Minneapolis General Electric Company, Minneapolis, Minn.; H. F. Frasse, secretary, P. A. Edison Electric Illuminating Company, Brooklyn, N. Y.

The E. H. Mumford Company, Front and Franklin streets, Elizabeth, N. J., announces its return to the molding machine business. It owns free from all litigation all patents on the inventions of E. H. Mumford and applications for patents under which the Mumford Molding Machine Company has been operating since 1909. A manufacturing arrangement has been made with the Samuel L. Moore & Sons Corporation, Elizabethport, N. J. A complete line of molding machines will rapidly be put on the market, made interchangeable with all previous Mumford machines as far as practicable, and the new machines will embody many points of merit made possible in redesigning.

The Southwark Foundry & Machine Company, Philadelphia, Pa., have secured the exclusive United States license to manufacture the Harris valveless engine, Diesel principle, which will hereafter be known as the Southwark-Harris valveless engine. The engine will be built in sizes from 75 B. H. P. to 1,000 B. H. P., for both marine and stationary service, and the recent extensive improvements to the plant and equipment insure the same satisfactory service to their customers, which has been the policy of the company since it was founded in 1836. Leonard B. Harris, the inventor of the Harris valveless engine will be associated with the company as consulting engineer and naval architect.

EXTRA DIVIDEND

The E. W. Bliss Company, Brooklyn, N. Y., have declared an extra dividend on the common stock of 1¼ per cent. The Bliss Company manufactures steel dies for many purposes, including automobile mud-guards, and the tremendous demand for motor cars has largely increased the normal business of this company. The company also manufactures munition shells of various varieties, including Whitehead torpedoes, and it is reported has on hand enormous orders for such production. It is said that in all these war orders amount to between $15,000,000 and $20,000,000, and will keep the plant up to capacity for the next two years.

CHANGE IN FIRM NAME

The name of the Hodgdon Brass Works, 421 Atlantic avenue, Boston, Mass., has been changed to the Eagle Metal Works. This company manufacture plumbers' specialties and all kinds of casting and also do plating, oxidizing and metal spinning.

The Northern Chemical Engineering Laboratories, chemical engineers, 625 Williamson street, Madison, Wis., announce that they have adopted the shorter name of the C. F. Burgess Laboratories. This change was made by amendment of articles of incorporation effective March 2, 1915. No change in management or ownership of the company has been made.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

To manufacture sheet metal products.—The United Stamping Company, Urbana, Ohio. Capital, $10,000. Incorporators, William E. Tomlinson and others.

To manufacture aluminum matchplates and snap flasks.—The Moser Pattern & Foundry Company, Newark, Ohio. Capital, $10,000. F. W. Moser, incorporator.

To manufacture metal specialties.—The Stark Stamping and Machine Company, Canton, Ohio. Capital, $40,000. Incorporators: William C. Seran, Hugh F. Seran, Frank A. Wilcox, Charles S. McGirr and I. M. Arnold.

FOREIGN TRADE OPPORTUNITIES

For addresses of these enquiries apply to Bureau of Foreign and Domestic Commerce, Washington, D. C., and give file number.

No. 16,038. Zinc.—An American consul in the Far East reports that the proprietor of a large zinc mine in his district wishes to be put in touch with American purchasers of this commodity.

No. 15,981. Aluminum.—An American consul in one of the neutral European countries reports that a business man in his district wishes to represent, on a commission basis, American exporters of aluminum.

No. 15,976. Electrolytic Copper.—An import agent in one of the neutral countries has informed an American consular officer that he desires cable quotations for the prompt delivery of 200 tons of electrolytic copper in bars. He will pay cash f. o. b. vessel in New York.

No. 15,972. Copper and Brass Plates, Tubes, Etc.—The Bureau of Foreign and Domestic Commerce is in receipt of a communication from an American chamber of commerce in a foreign country stating that it has been called upon to supply the names and addresses of manufacturers and exporters of copper and brass plates, sheets, rods, tubes, wire, etc. Bank reference is given.

No. 15,985. Metal products.—An American consul in Europe reports that a government contract agent in his district desires to represent American manufacturers of unfinished metal products, such as pig, bar, hoop and sheet metal, plates, tubes, pipes, forgings, and castings of iron, steel, copper, zinc, etc. Quotations, etc., should be submitted at once. Correspondence must be in Italian. Weights and measures should be in the metric system, and prices stated in gold lire. Bank reference is given.

No. 16,070. Surgical and geodetic instruments, laboratory supplies, etc.—The Bureau of Foreign and Domestic Commerce is in receipt of a letter from a machine company in the United States transmitting the name and address of a firm in Russia which wishes to receive information regarding metal-working lathes and milling machines. The firm also desires full information relative to optical goods, surgical and geodetic instruments, and physical and chemical laboratory supplies.

INQUIRIES AND OPPORTUNITIES

Under our directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

PRINTED MATTER

Air Hoists and other Pneumatic Lifting Appliances are fully described in a new catalog just issued by the Northern Engineering Works, Detroit, Mich. The catalog presents only a few of the many designs of compressed air hoists manufactured by this company.

Seamless Tubing.—A handbook for architects, engineers and superintendents has been issued by the Bridgeport Brass Company, Bridgeport, Conn. This book contains ninety-six pages, and is full of very valuable information relating to the manufacture of brass and copper seamless tubes for all purposes, including condenser tubing, brass and admiralty mixtures, plain and tinned.

Metal Finishes.—The Charles F. L'Hommedieu Sons Company, Chicago, Ill., have sent out samples of the new labels that they are using on their packages of their well-known finishing compositions. The two compounds that they particularly recommend are the Nubian Lime and the Reliance White finishes, which are said to be unexcelled for high color on nickel, brass, bronze, etc.

Safety First.—The Whiting Foundry Equipment Company, Harvey, Ill., have made use of the safety bulletins issued by the National Founders' Association, and have posted copies of it throughout their works. This particular bulletin contains the cautionary rules for the safe operating of cranes. The bulletin as issued by the Whiting people is printed in red and black on one side of a poster 14 by 28 inches and contains fifty rules for the benefit of the crane-men, floor-men and repair-men. Copies may be had upon request.

Lacquers.—The C. J. Nikolas & Co., of Chicago, Ill., have issued a comprehensive catalog relative to the extensive line of lacquers manufactured by them. The catalog is embellished with a fine half-tone of C. J. Nikolas, the originator of Nikolas lacquers, and a photogravure of the main office and factory in Chicago. The book also contains valuable information concerning the Nikolas products, such as bedstead, acid proof, alcohol, glossy black and dead black lacquers, lacquer enamels, and all varieties of colors, gold dye, etc. Also lacquer spraying machines and the Nikolas hub, which is a device for utilizing old worn down sewed buffs. Some important information for the lacquer department is also contained in the work.

Monel Metal.—The Supplee-Biddle Hardware Company, Philadelphia, Pa., in the March issue of their bulletin give a description and photograph of the modern casting plant which they are now operating in Philadelphia. This plant is equipped with every appliance necessary to assist in securing good castings of Monel metal. As Monel metal does not rust or corrode, and is said to be as strong as steel, it is rapidly taking the place of copper and bronze in cases where these metals would quickly require replacing. Copies of the bulletin giving full description of the immense variety of forms in which Monel metal is now being produced may be had by corresponding with the Supplee-Biddle Hardware Company, 513-517 Commerce street, Philadelphia, Pa.

Furnaces.—The Monarch Engineering and Manufacturing Company, Baltimore, Md., have just issued a lot of new literature in the interest of their line of Monarch furnaces which includes all varieties adapted for all fuels, oil, gas, coke and coal, as well as portable heaters and drill steel forges. The literature comprises catalogs series 25, combination tool room gas furnace; series 27 and 28 F, drill steel forges; series 29,

furnaces; series 30, galvanizing and tinning furnaces; series 31, scrap melting; series 33, double chamber melting furnace; series 34, soft metal melting furnaces; series 35, portable heaters; 37 A, core ovens and series 38, tilting reverberatory furnaces. Copies of all of these booklets and bulletins will be sent upon request, or the whole line may be had by inquiring for the small complete catalog.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL MARKET REVIEW

NEW YORK, April 5, 1915.

COPPER.

The price of copper has been pushed up one cent a pound during the month of March—from 14¾ for electrolytic delivered terms to 15¾ the selling price of the large producers at the close. The export demand has been good, orders seemed to come along each day, and in such volume that producers only had to pick out the business they cared for and put up the price on the balance, so that very nearly each day the price was lifted. It is understood that Germany has bought considerable copper, running into several million pounds—this copper is being carried here for German account and is to be shipped immediately the war is over. This is not exactly a bull point for copper, rather the other way, but everyone here seems to think that with the end of the war there will be an enormous demand for copper from all over the world. Producers meanwhile are quietly intimating that there will not be enough copper to go around. Home consumers have come into the market lately, but the home buying has not been active at any time. The business of the country, in general, is on about a 50 per cent. basis and no one has any faith in the country or in the administration or anything else.

The exports have been very good—about 1,000 tons a day—and it has been on this business that prices have been pushed up. Producers are asking today 16 cents delivered terms for electrolytic, Lake is quotable at around 16½ cents, and casting brands at from 15 to 15¼ cents.

TIN.

The tin market has been very much excited and sensational. Prices have advanced and declined several cents in one day. Shipments from London have been held up on account of labor troubles and then the British Government put an embargo on exports of tin except under very restrictive conditions. Prices started at around 40 cents, and later in the month tin was sold as high as 55 cents spot delivery. The arrival during the month were only 1,200 tons and the stocks on hand on the first of March were about 2,000 tons. Consumers have been getting along with as little tin as possible and contracts for March tin have been adjusted on the best possible basis for all concerned in view of the uncontrollable conditions prevailing. Spot tin is quotable today at around 51 cents. April is offered at 40 cents and May and June at around 38c. to possibly 37 cents a pound.

LEAD.

The price of lead has been advanced 35 points, or $7 per ton since the end of February—from $3.85 to $4.20 New York basis. The market is very strong and independents are not inclined to sell at the trust price today. The trust price does not represent the actual market. The demand for export at ⅛ cent per pound above the trust price is the actual market today.

SPELTER.

The price of ores got to be so high when spelter was being pushed up to around 11 cents that there was no money in it even at 11 cents for the refineries, and the break in price has been engineered to bring the price of ores down to a reasonable basis. The market is controlled by a few refineries and is being manipulated to bring down the price of ores and that's about all there is to say concerning the spelter market. Spelter was offered on the Metal Exchange at way below what consumers could buy at and the market was broken by more or less fake quotations. When the price gets down to say about 5 cents it will probably be the policy of the refinery owners to make contracts for ores and then up goes the price of spelter again. Today the actual market for the metal is around 9¾ for prompt New York, about 9 cents for April, 8⅝ cents for May, and 8 cents for June.

ALUMINUM.

The market is quiet and not affected by the war in Europe. Ninety-eight to 99 per cent ingots are quoted at 18¾ cents per pound.

ANTIMONY.

This market has been very active and prices today are from 5 to 7 cents per pound higher. Cooksons is quotable at 30 cents, Halletts at 26, other grades from 23 to 24 cents, and Chinese and Japanese at around 21½ cents today.

SILVER.

The market has held fairly steady at around 50 cents New York and 23 5/8d. in London. Price today is 50⅛ cents New York, 23⅝d. London.

PLATINUM.

Market has been very dull and prices continue to sag—ordinary refined is quoted at $41.00 per ounce, 10 per cent. hard at $44.00.

QUICKSILVER.

The price of quicksilver has been more or less erratic on account of short supplies. Today the wholesale price is quoted at $67.00 per flask, and smaller lots have been sold at from $75.00 to $80.00 per flask.

SHEET METALS.

Sheet copper was advanced March 27 to 20¾ cents base. Copper wire is quotable at 16¾ cents, and brass prices are all higher.

OLD METALS.

The old metal market has been fairly active and some good foreign business has been done. To prove that a "dollar's a dollar for a'that," German firms are today shipping scrap copper to France. Prices are better, owing to the advance in the raw metals.—J. J. A.

MARCH MOVEMENTS IN METALS

	Highest.	Lowest.	Average.
COPPER.			
Lake	16.75	14.75	15.50
Electrolytic	15.85	14.55	15.00
Casting	15.15	14.00	14.35
TIN	55.00	40.25	49.00
LEAD	4.20	3.90	4.10
SPELTER	11.25	9.50	10.15
ANTIMONY (Hallett's)	28.00	21.25	24.15
SIVER	51½	49.00	50.24

WATERBURY AVERAGE

The average prices of Lake Copper and Brass Mill Spelter per pound as determined monthly at Waterbury, Conn.:

1913—Average for year, 15.83. 1914—Average for year, 13.91. 1915—January, 14⅛. February, 15.25. March, 15.75.

Brass Mill Spelter. 1915—January, 6.55; February, 11.85; March, 12.15.

DAILY METAL PRICES

We have made arrangements with the New York Metal Exchange by which we can furnish our readers with the Official Daily Market Report of the Exchange and a year's subscription to THE METAL INDUSTRY for the sum of $10. The price of the Report alone is $10. Sample copies furnished for the asking. We can furnish daily telegraphic reports of metal prices. Address THE METAL INDUSTRY, 99 John street, New York.

Metal Prices, April 5, 1915

NEW METALS.

	Price per lb. Cents.
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.	
Lake, carload lots, nominal	16.50
Electrolytic, carload lots	15.85
Castings, carload lots	14.25
TIN—Duty Free.	
Straits of Malacca, carload lots	48.50
LEAD—Duty Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig lead, carload lots	4.20
SPELTER—Duty 15%.	
Western, carload lots, nominal	9.65
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½c. per lb.	
Small lots, f. o. b. factory	24.00
100 lb. lots, f. o. b. factory	21.00
Ton lots, f. o. b. factory	19.00
ANTIMONY—Duty free.	
Cookson's cask lots, nominal	30.00
Hallett's cask lots, nominal	28.00
Hungarian grade	24 to 25
NICKEL—Duty Ingot, 10%. Sheet, strip and wire 20% ad. valorem.	
Shot, Plaquettes, Ingots. Blocks according to quantity	.38 to .43
ELECTROLYTIC—3 cents per pound extra.	
MANGANESE METAL	nominal
MAGNESIUM METAL—Duty 25% ad valorem (100 lb. lots)	nominal
BISMUTH—Duty free	2.25
CADMIUM—Duty free	1.85
CHROMIUM METAL—Duty free	.75
COBALT—97% pure	2.00
QUICKSILVER—Duty 10%, per flask	$67.00 to $70.00
	Price per oz.
GOLD—Duty free	$20.67
PLATINUM—Duty free	38.00
SILVER—Government assay bars—Duty free	50c.

INGOT METALS.

	Price per lb. Cents.
Silicon Copper, 10%.....according to quantity	25 to 28
Silicon Copper, 20%..... " "	28 to 32
Silicon Copper, 30% guaranteed " "	30 to 34
Phosphor Copper, guaranteed 15% "	21 to 25
Phosphor Copper, guaranteed 10% "	19½ to 23½
Manganese Copper, 30%..... " "	22 to 26
Phosphor Tin, guaranteed 5%. " "	57 to 60
Phosphor Tin, no guarantee... " "	53 to 56
Brass Ingot, Yellow..... " "	12 to 13
Brass Ingot, Red..... " "	12¼ to 13
Bronze Ingot ..... " "	15 to 16
Manganese Bronze Ingots..... " "	20 to 21½
Phosphor Bronze ..... " "	18 to 19½
Casting Aluminum Alloys..... " "	16 to 18
PHOSPHORUS—Duty free. According to quantity	30 to 35

OLD METALS.

Dealers' Buying Prices. Cents per lb.		Dealers' Selling Prices. Cents per lb.
11.75 to 12.25	Heavy Cut Copper	13.25 to 13.50
11.50 to 11.75	Copper Wire	13.00 to 13.25
10.50 to 10.75	Light Copper	12.00 to 12.25
10.25 to 10.50	Heavy Mach. Comp	11.50 to 11.75
8.25 to 8.50	Heavy Brass	9.50 to 9.75
6.25 to 6.50	Light Brass	7.25 to 7.50
7.75 to 8.00	No. 1 Yellow Brass Turnings	8.50 to 9.00
9.00 to 9.25	No. 1 Comp. Turnings	9.75 to 10.25
3.30 to ——	Heavy Lead	—— to 3.50
5.50 to ——	Zinc Scrap	—— to 6.00
5.50 to 6.50	Scrap Aluminum Turnings	6.00 to 7.00
11.50 to 12.00	Scrap Aluminum, cast alloyed	12.00 to 13.00
13.00 to 14.00	Scrap Aluminum, sheet (new)	13.00 to 14.00
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
17.00 to 23.00	Old Nickel	17.00 to 23.00

PRICES OF SHEET COPPER.

BASE PRICE, 20¾ Cents per Lb. Net.

Width.	LENGTH.	64 oz. and over.	32 oz. to 64 oz.	24 oz. up to 32 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
	SIZE OF SHEETS.	Extras in Cents per Pound for Sizes and Weights Other than Base.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins., but not wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins., but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins., but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins., but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins., but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Not longer than 120 inches.	3	5	9						
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 inches.	4	6							

The longest dimension in any sheet shall be considered as its length.

CIRCLES, 8 IN. DIAMETER AND LARGER, SEGMENTS AND PATTERN SHEETS, advance per pound over prices of Sheet Copper required to cut them from ..... 3c.

CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices of Sheet Copper required to cut them from ..... 5c.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier, advance per pound over foregoing prices ..... 1c.

COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square foot, advance per pound over foregoing prices ..... 2c.

COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled Copper.

ALL POLISHED COPPER, 20 in. wide and under, advance per square foot over the price of Cold Rolled Copper ..... 1c.

ALL POLISHED COPPER, over 20 in. wide, advance per square foot over the price of Cold Rolled Copper ..... 2c.

For Polishing both sides, double the above price.

The Polishing extra for Circles and Segments to be charged on the full size of the sheet from which they are cut.

COLD ROLLED COPPER, prepared suitable for polishing, same prices and extras as Polished Copper.

ALL PLANISHED COPPER, advance per square foot over the prices for Polished Copper ..... 1c.

ZINC—Duty, sheet, 15%.

	Cents per lb.
Carload lots, standard sizes and gauges, at mill	13.50 basis, less 8%
Open casks, jobbers' prices	14c.
Casks, jobbers' prices	14½c.

Metal Prices, April 5, 1915

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect March 29, 1915, and until further notice.

To customers who buy over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.17⅛	$0.18¼	$0.19⅛
Wire	.16⅞	.18¼	.19⅛
Rod	.16⅞	.19	.20⅛
Brazed tubing	.20¾	—	.23⅜
Open seam tubing	.20¾	—	.23⅜
Angles and channels, plain	.20¾	—	.23⅜

50% discount from all extras as shown in Brass Manufacturers' Price List.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass....	½c. per lb. net advance	
" —Best spring, drawing and spinning brass.....	1½c. " " " "	
Wire—Extra spring and brazing wire.....	½c. " " " "	
" —Best spring and brazing wire.....	1c. " " " "	

To customers who buy 5,000 lbs. or less per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.18⅜	$0.19½	$0.20⅝
Wire	.18⅜	.19½	.20⅝
Rod	.18⅜	.20¼	.21⅜
Brazed tubing	.22	—	.24⅝
Open seam tubing	.22	—	.24⅝
Angles and channels, plain	.22	—	.24⅝

Net extra as shown in Brass Manufacturers' Price List.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass....	½c. per lb. net advance	
" —Best spring, drawing and spinning brass.....	1½c. " " " "	
Wire—Extra spring and brazing wire.....	½c. " " " "	
" —Best spring and brazing wire.....	1c. " " " "	

BARE COPPER WIRE—CARLOAD LOTS.

16¾c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	19½c. per lb. base
100 lbs. to 300 lbs. in one order	20c. " " "
Less than 100 lbs. in one order	21½c. " " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, 20c. per lb.
Seamless Copper Tubing, 23c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe sizes with price per pound.

⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
28	27	22	21	20	20	20	20	20	20	20	21	22	24	26	27

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet— Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1⅛ inch	22	24
1¼ inch	25	27
1½ inch	32	35
1¾ inch	45	48
2 inch	56	60

Discount, 40%.

PRICE FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod	20½c. net base
Muntz or Yellow Metal Sheathing (14" x 48")	17½c. " "
" " " " Rectangular sheets other than Sheathing.	20c. " "
" " " " Rod	17½c. " "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 25⅝c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Sheet Block Tin—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more 5c. over Pig Tin. 50 to 100 lbs. 6c. over, 25 to 50 lbs. 8c. over, less than 25 lbs. 10c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 4c. over Pig Tin. 50 to 100 lbs. 5c. over, 25 to 50 lbs. 7c. over, less 25 lbs. 9c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Gauge.	Width. Inches.	1 ton.	50 to 2,000 lbs.	Less than 50 lbs.
20 and heavier	3-30	25.9	26c.	29c.
	3-30	26.9	27c.	30c.
21 to 24 inclusive	30-48	28.9	29c.	32c.
	48-60	31.9	32c.	35c.
25 to 26	3-30	27.9	28c.	31c.
	30-48	29.9	30c.	33c.
27	3-30	28.9	29c.	32c.
	30-48	31.9	32c.	35c.
28	3-30	29.9	30c.	33c.
	30-48	32.9	33c.	36c.
29	3-30	30.9	31c.	34c.
	30-48	34.9	35c.	38c.
30	3-30	31.9	32c.	35c.

The above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheet. No charge for boxing. F. O. B. Mill.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 22 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5/16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 in.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	26	23	..	..	13	11	9	8	15	22
12.	.109.	..	..	..	..	..	..	..	25	..	..	..	14	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	16	..	..	..	..	..
16.	.065.	..	..	..	..	..	27	26	26	23	22	20	20	20	20	26	30	56
18.	.049.	..	..	..	..	32	29	28	27	24	25	25	25	..	..	..	..	..
20.	.035.	116	..	45	38	33	32	31	29	28	29	29	29	30	37	45	57	80
21.	.032.	..	..	..	39	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	137	97	47	41	37	36	34	33	..	..	44	..	..	..	..	..	..
24.	.022.	187	132	107	87	78	72	61	59	65	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Price per lb. over 25 lbs., Diameter, B. & S. Gauge, No. 000 to 10 and 12, 26 cents. No. 12 to 20 inch, 28 cents.

BASE PRICE GRADE "B" GERMAN SILVER SHEET METAL.

Quality.	Net per lb.	Quality.	Net per lb.
5%	18¼c.	16%	22¾c.
8%	20c.	18%	23¼c.
10%	20½c.	20%	25½c.
12%	21½c.	25%	33¾c.
15%	22½c.	30%	39¾c.

GERMAN SILVER WIRE.

Quality.	Net per lb.	Quality.	Net per lb.
5%	19¼c.	15%	26½c.
8%	21c.	16%	27½c.
10%	22½c.	18%	29¼c.
12%	24½c.	30%	45¼c.

The above Base Prices are subject to additions for extras as per lists printed in Brass Manufacturers' Price List and from such extras 50% discount will be allowed. The above base prices and discounts are named only to wholesale buyers who purchase in good quantities. Prices on small lots are considerably higher.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 1c. below to 4c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2½c. to 3½c. above the price of bullion.